2014

GVU ANNUAL REPORT

Georgia Tech GVU Center

About the Cover

Mapping Place is an interactive tabletop and projection-based museum installation that allows museum visitors to create and explore Lukasas, artifacts used by Luba people of the central Congo for recording and retelling genealogy, history, spirituality and place.

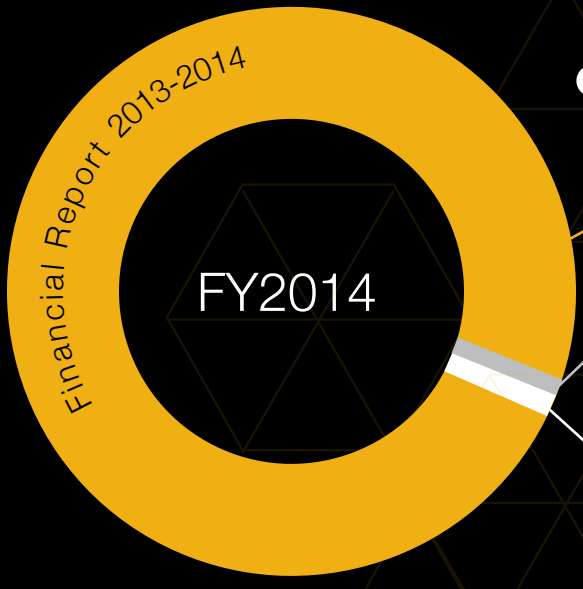
More info: synlab.gatech.edu/

Message from the Director

Keith Edwards
Director, GVU Center

The GVU Center is an interdisciplinary research center on the Georgia Tech campus, focused on pushing the boundaries of how people interact with technology. Our 80+ faculty have broad expertise spanning computing, industrial design, digital media, psychology, public policy, and more, and have made pioneering innovations in areas such as wearable computing, computational creativity, the learning sciences, and personal health informatics. Our mission is to bring together researchers from across the campus, and across the world, who are interested in empowering people through technical innovation.

Throughout our 23-year history we have provided a conduit for connecting cutting edge university research to industry, NGOs, and the public. I hope the news highlights in this annual report give you a better sense of the work going on in the GVU Center, and the potential it has for impact on the world. If you're an alum or friend, I'd like to invite you to reconnect. If you're an industry partner – or a potential partner – I invite you to contact me to learn more about the innovation going on at GVU, and to explore how we might work together.



Georgia Tech GVU Center

Total FY2014 Expeditures
$8,620,919

Research
97.3%.....$8,388,811

- Federal Contracts
  58.4%.....$4,902,423
- Industry Partners & Foundations
  38.8%..... $3,253,496
- State Funds
  2.8%.....$232,892

External Relations
1.1%.....$94,625

Administration
1.6%.....$137,483

GVU.gatech.edu Facebook.com/GVUcenter @GVUcenter

Corporate Partners

Adobe, ACT, John Deere, ESPN, ETRI, GE, Google, Humana, intel, Lockheed Martin, Microsoft Research, Motorola, Nokia, P&G, Panasonic, Qualcomm, Samsung, Steelcase, Texas Instruments, Toyota, Willow Garage, Yahoo!, zynga

People-Centered Computing Research, Now At Your Fingertips

The research enterprise for people-focused computing technology is growing every day and taking many exciting directions. The GVU Center's research community is at the heart of advancing the diverse approaches and contributions to this work at Georgia Tech and beyond. More than 80 faculty and 300 graduate students are exploring new ideas and applications through computing technology.

For the first time, the GVU Center is bringing together a searchable online portfolio of research from across our community. This resource is part of the new GVU Center website and brings together more than 20 broad research areas represented by more than 100 projects and 50 labs that collaborate with GVU.

We invite you to explore this new online collection of research information and to help us grow the collection into a comprehensive, dynamic resource for the various work related to people-centered computing technology.

The new website also offers resources and information on our researchers, labs, news, events and industry partnerships.

Get Started:
gvu.gatech.edu/research/projects

2014 Foley Scholars

L to R: Alex Zook, Human-Centered Computing, is researching the creation of artificially intelligent (AI) systems to augment games; Deana Brown, Human-Centered Computing, designs and prototypes social and ubiquitous technologies; and Mason Bretan, Music Technology, researches robotic musicianship. (Finalists: Laura Barg-Walkow, Casey Fiesler, Hwajung Hong, Aditi Misra, and Andrew Quitmeyer).

2013 Foley Scholars

The GVU Center honored the 2013-2014 Foley Scholars Jie Tan, Chris DeLeon and Iulian Radu along with the five Foley Finalists at the 6th Annual Foley Scholars Dinner on Oct. 30, 2013. Pictured L to R: Mason Bretan, Alexander Zook, Jie Tan, Chris DeLeon, Casey Fiesler and Caleb Southern (not pictured: Iulian Radu and Candace Brakewood).

GVU Community Celebrates Research Advancements

A large part of the collaborative work by faculty and student researchers in the GVU Center leads to new computing-powered innovations and guides users through a rapidly shifting technology culture.

The GVU Center annually recognizes top student researchers as **James D. Foley Scholars**, the center's highest student achievement. After a competitive process, graduate researchers who are making significant contributions in their fields are awarded the James D. Foley Scholarship and recognized at the Foley Scholars Dinner each fall. Alumni, donors and faculty celebrate the achievements of the finalists, who are individually recognized during the main program along with the Foley scholars.

In its seventh year, the Foley Scholarship includes a $5,000 award, gives students visibility for their research and offers potential new collaborative opportunities. It is supported by donor gifts to the scholarship endowment. James Foley, a professor of Interactive Computing and for whom the scholarship is named, is an advocate for student success and continues to build the research community through his support of the GVU Center and the Master of Science in Human-Computer Interaction program.

Foley Scholar research: gvu.gatech.edu/foley-scholars

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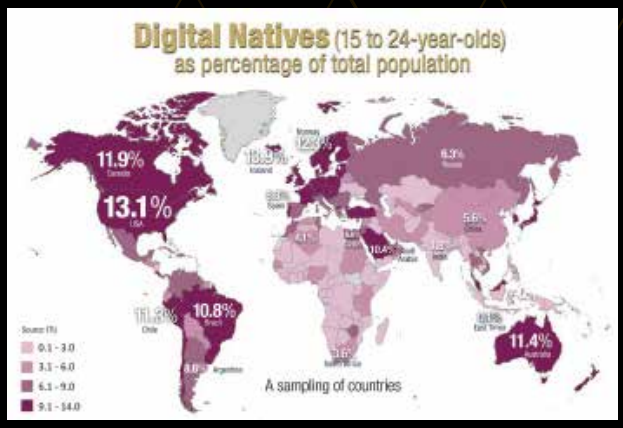
Computing technology research takes on many forms in the GVU Center, whether it's deciphering the social media stratosphere, putting Atlanta's public transit information at your fingertips, advancing wearable computing, or a score of other high-concept applications and prototypes that are advancing how technology impacts our lives.

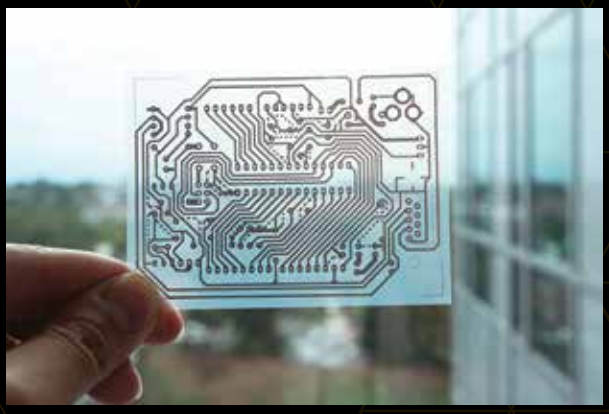
This academic year our researchers broke new ground on how to get the most out of technology interactions. This snapshot of our community of researchers shows a small sample of computing possibilities becoming reality through the collaborative and dynamic environments at Georgia Tech and the GVU Center.

gvu.gatech.edu

Where in the World are Young People Using the Internet?

Georgia Tech and the International Telecommunication Union (ITU) conducted a study to measure, by country, the world's "digital natives," people born around the time the personal computer was introduced. Associate Professor **Mike Best** (International Affairs and Interactive Computing) co-authored the study, part of the Measuring the Information Society 2013 Report, which found only 30 percent of the world's population between the ages of 15 and 24 years old has been active online for at least five years. A key statistic Best says is the number of digital natives as compared to a country's total population because countries with a high proportion of young people already online are positioned to define and lead the digital age. (Iceland's 13.9 percent is #1 with the United States' 13.1 percent ranking sixth.)





Inkjet-Based Circuits at Fraction of Time and Cost

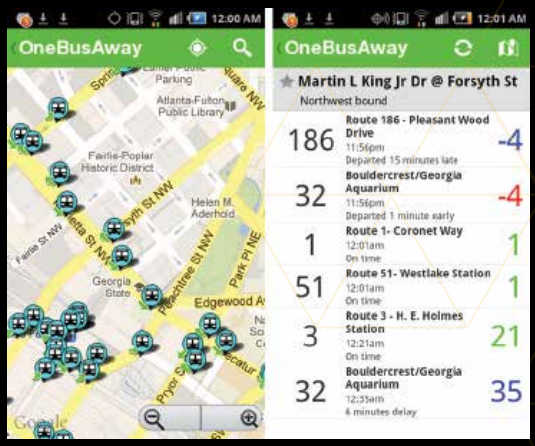
Georgia Tech, the University of Tokyo and Microsoft Research collaborators have developed a novel method to rapidly and cheaply make electrical circuits by printing them with commodity inkjet printers and off-the-shelf materials. For about $300 in equipment costs, anyone can produce working electrical circuits in the 60 seconds it takes to print them. The technique, called instant inkjet circuits, allows the printing of arbitrary-shaped conductors onto rigid or flexible materials and could advance the prototyping skills of non-technical enthusiasts and novice hackers. Georgia Tech researchers included **Ben Cook**, (pictured, PhD ECE 14), PhD CS student **Cheng Zhang**, and Regents' Professor **Gregory Abowd** (Interactive Computing).

Research Reveals Phrases that Pay on Kickstarter

Researchers at Georgia Tech studying the burgeoning phenomenon of crowdfunding have learned that the language used in online fundraising hold surprisingly predictive power about the success of such campaigns. As part of their study of more than 45,000 projects on Kickstarter, PhD CS student **Tanushree Mitra** and Assistant Professor **Eric Gilbert** (Interactive Computing) reveal dozens of phrases that pay and a few dozen more that may signal the likely failure of a crowd-sourced effort. Those campaigns that follow the concept of reciprocity – that is, offer a gift in return for a pledge – and the perceptions of social participation and authority, generated the greatest amount of funding.

Integrating Real-Time Information for Metro Atlanta Public Transit

The mobile app OneBusAway, which tracks public transportation in real time, added arrival times for MARTA trains in 2014 in addition to the MARTA buses and Georgia Tech shuttles already featured in the app. The app also added frequency data for the new Atlanta Streetcar route (which opened at the end of 2014) and is working with the Streetcar to equip vehicles to provide real-time transit information. OneBusAway is being integrated into Atlanta's transit network by Georgia Tech researchers, led by Assistant Professor **Kari Watkins** (Civil and Environmental Engineering). In addition to providing users with information, the program is used to understand the impacts of real-time information on riders. The open-source code has a growing national footprint with the app being used in other major spots such as New York, Seattle, Tampa, and elsewhere.

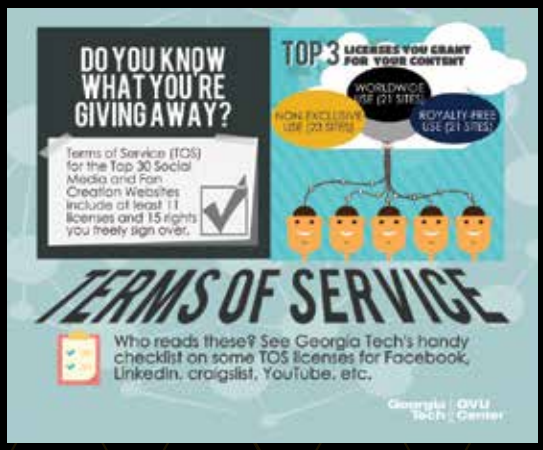


Advancing Digital Games Technology and Scholarship

The launch of the Games@GeorgiaTech initiative brought together the institute's sprawling gaming ecosystem and provided a single portal for information on Georgia Tech's mix of research, education, and culture in gaming (games.gatech.edu). Led by Associate Professor **Celia Pearce** (Digital Media) and Assistant Professor **Mark Riedl** (pictured, Interactive Computing), Games@GeorgiaTech is designed to support the institute's leading game researchers, faculty and students in advancing digital game exploration and development.

Do You Read Terms of Service? Maybe You Should

Researchers found that internet users face considerable difficulty in understanding what content they give away when signing up for free online services. A Georgia Tech study by PhD HCC candidate **Casey Fiesler** and Professor **Amy Bruckman** (Interactive Computing) on Terms of Service for popular websites shows that when posting content to the likes of LinkedIn, craigslist or IMDB, users may be giving away more than they think, including the right to take back the data once it is made available. Researchers note that with so many people posting everything from status updates to digital art online, intellectual property rights are increasingly important to the end user.

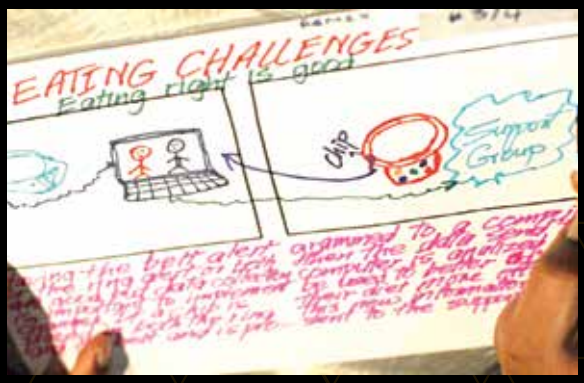


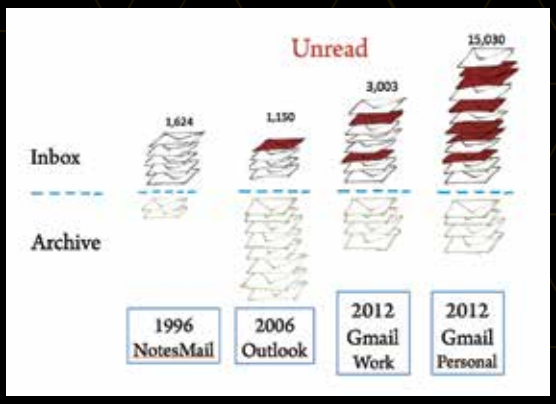
Robotic Prosthesis Turns Drummer into a Three-Armed Cyborg

Professor **Gil Weinberg** (Music and Interactive Computing) has created a robot that can be worn by amputees, allowing its technology to be embedded into humans. The robotic drumming prosthesis has motors that power two drumsticks. The first stick is controlled both physically by the musicians' arms and electronically using electromyography (EMG) muscle sensors. The other stick "listens" to the music being played and improvises. Weinberg says the human-prosthesis combination creates a cyborg in which both human and machine arms collaborate and improvise to create music in realtime.

Technology Design for Health and Wellness among Immigrant Women

PhD HCC student **Deana Brown** and Professor **Beki Grinter** (Interactive Computing) collaborated with immigrant women from the Caribbean to identify health and wellness challenges they faced and to let the participants conceptualize technologies to help them manage these issues. Stress, dietary challenges (specifically obesity), mental health, and domestic abuse formed the focal themes for the design sessions. Their design approaches emphasized rebuilding support structures, reducing stressors through entertainment and relaxation and encouraging positive gradational lifestyle changes. This work has led to the creation of new technologies that support rather than replace social solutions to the health and wellness challenges faced by these and other immigrant women.





Email Overload in the Age of Gmail

PhD CS candidate **Catherine Grevet** (pictured) and Assistant Professor **Eric Gilbert** (Interactive Computing) show that email overload is still a problem today. Georgia Tech and Google researchers analyzed the state of email overload in the 21st Century, and compared personal with work email accounts. They found that work email tends to be status overloaded and that disorganization in work email doesn't come from volume but is driven more by high unread counts. Personal email is status and also type overloaded. Personal email often contains many different types of emails such as those related to job searches, money transactions, etc. Their research suggests new ways to redesign existing email systems to better support the complex electronic communication needs of people today.

New Game Studio Puts Games in Front of Audiences

The Georgia Tech Game Studio launched with a mission to enable student game developers to conceptualize, develop, and ship original games. Led by **Blair MacIntyre** (Interactive Computing) and **Ian Bogost** (Digital Media), the studio focuses on exploring a broad spectrum of play opportunities, rapidly prototyping game ideas, and evolving those prototypes into full-fledged, releasable games. The studio's first free game for iOS, Electro Terrestrials, is now available. More information at gamestudio.gatech.edu.

GEORGIA TECH
GAME STUDIO
WE MAKE GAMES

Wearable Tech of Many Designs

A wearable technology exhibit curated by Georgia Tech and led by Professor **Thad Starner** (pictured, Interactive Computing) and Research Scientist **Clint Zeagler** (Industrial Design) debuted in 2014 in Toronto at the ACM Conference on Human Factors in Computing Systems (CHI 2014), showcasing more than 20 years of research and commercial efforts. "Meeting the Challenge: The Path Towards a Consumer Wearable Computer" is a one-of-a-kind collection showing the path of wearable tech through the decades and in different industries. The exhibit has since been shown in Germany at the Deutsches Museum and other locations, in China at the World Economic Forum and will next appear in California at the Computer History Museum (2015).

Mobile Solution for Chronic Disease Management has High Adoption

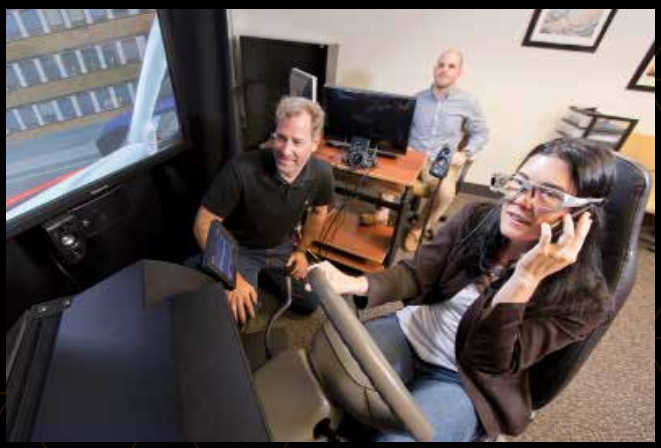
My Journey Compass was designed by PhD HCC student **Maia Jacobs** (pictured), Postdoctoral Fellow **James Clawson**, and Professor **Beth Mynatt** (Interactive Computing) to increase patient engagement for improving health outcomes and create a potential gateway to impact chronic disease management. The researchers tested the tool with a small group of breast cancer patients and included a suite of preinstalled applications and health management resources on Nexus 7 Android tablets. Designed and deployed with health care providers, the high adoption rate of the tablet tool directly correlated to its customization (for health and non-health purposes), mobile use, balance of information that was relevant and not overwhelming, and privacy advantages.

Understanding How Online Language Reflects Identity

Computer-mediated communication and its dominance in society are driving fundamental changes in the nature of written language, a phenomenon Assistant Professor **Jacob Eisenstein** (Interactive Computing) examines using research methods at the intersection of machine learning and sociolinguistics. His research on Twitter has found that rather than moving towards a single unified "netspeak" dialect, language evolution in online communication reproduces existing fault lines in spoken American English. This work shows the persistence of regional differences in traditional slang words from speech, but also finds regional trends in linguistic innovations such as emoticons and abbreviations. Eisenstein's recent work links language variation to social networks, showing how the density and strength of social network ties predicts which linguistic norms each individual will adopt.

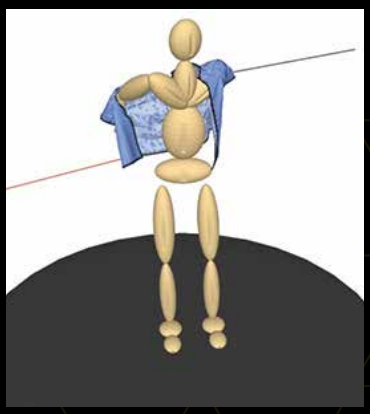
Effects of Specific Emotions in Different Driving Conditions

Associate Professor **Bruce Walker** (pictured on left, Psychology and Interactive Computing) leads research in driving safety with one aspect of his work examining drivers' emotions while on the road: in a recent study, seventy undergraduate participants drove in a vehicle simulator that recreated three different road conditions designed to induce different states of emotion. The students' subjective judgment of driving confidence, risk perception, and safety level were measured following the test. The results showed that anger and happiness lowered perceived safety levels and produced more driving errors when compared to fear or neutrality. The work advances the development of a model for regulating emotions and creating adaptive interfaces for drivers.



Getting Dressed: Simulating Activities of Daily Living

Clothing oneself is considered essential to maintaining a functional independent life. Associate Professor **Karen Liu** (Interactive Computing) is aiming to recreate this unique human behavior through physical simulation and eventually enable assistive robots to dress real humans. The work involves designing motor control algorithms for dressing upper and lower body for oneself and others. Beyond robotic applications, the research is expected to expand the current biomechanical knowledge in human coordination control mechanisms, to advance the control algorithms for high-dimensional, nonlinear systems in control theory, and to enhance the state-of-art simulation techniques for manipulating deformable objects.



Transforming Communities and Redefining Civic Participation

GVU researchers are applying the power of computing to strengthen local communities and enhance community engagement and social awareness. Our research on Civic Computing is focused on creating thriving communities where we live, work, and travel; not only is such work vital to our future culture and infrastructure, but it also helps chart the future of social media and other computing technologies. GT researchers in Civic Computing tackle the work in many ways, a few of which are highlighted here.

Kari Watkins (Civil and Environmental Engineering) and **Chris Le Dantec** (Digital Media) are using crowdsourced data about bicycle ridership to inform policymakers about the routes riders take as well as issues that limit ridership. **Cycle Atlanta** creates a better view of how people move through the city by utilizing a mobile app, which records routes in real-time and lets users report problems such as potholes. The Cycle Atlanta project is part of a larger vision by the Atlanta Regional Commission for sustainable growth in the metro area.

Visit the interactive map: cycleatlanta.org/rides

Keith Edwards (Interactive Computing) has developed new information sharing technologies for building connectedness within civic networks; these technologies aim to enhance efforts by government agencies and NGOs combating persistent social issues, such as gang violence and trafficking and abuse of minors. New understanding in how community-based organizations connect through technology shows the need to configure these tools to better support groups of groups rather than just individuals. Edwards' work also shows how computing systems can enhance existing neighborhood ties for stronger communities.

Carl DiSalvo (Digital Media) is leading research into issue-oriented hackathons with a focus on civic hackathons and hackathons related to food and food systems. His group conducted the first Atlanta Food Data Hack, bringing together a diverse group of stakeholders to conceptualize and prototype new uses of information and communication technologies to support local food initiatives. DiSalvo is on the executive committee of the Intel Science and Technology Center for Social Computing, an effort to advance the study and invention of new forms of social computing.

Beki Grinter (Interactive Computing) seeks to strengthen relationships within separated families by using technologies that allow parents and children to communicate at a distance, and which also involve the extended care network of educators and relatives. The research creates a hybrid approach to designing social spaces– merging voice-based and online platforms– in an effort to improve access and affordability for the users, and to build trust among all the stakeholders in the childrens' welfare.

Experience a short demo here: auburn.gatech.edu/demos

Jay Bolter and **Nassim JafariNaimi** (Digital Media) are using augmented reality to engage people in the history and culture of shared public spaces. Their **Sweet Auburn Digital Media Initiative** uses AR to highlight and preserve the history of the Auburn Avenue Historical District, the launching point for the Civil Rights Movement. That era is brought to life when visitors view Auburn Avenue through their mobile devices and see historic photos overlaid on the scene and can hear the voices from the community. Researchers are working with community and government groups to bring this living history to the public.

Select Government and Community Partners

Atlanta Bike Coalition • Atlanta Community Food Bank • Atlanta Regional Commission • Atlanta Streetcar • CARE • Carter Center
Center for Civic Innovation • Central Atlanta Progress • City of Atlanta • High Museum of Art • Historic Westside Cultural Arts Council
iLab Liberia • Latin American Association • Marcus Autism Center • Midtown Alliance • USAID • WABE 90.1