Computer Highlights Society Magazines

The IEEE Computer Society’s 13 peer-reviewed technical magazines cover cutting-edge computing topics including scientific applications, Internet computing, machine intelligence, pervasive computing, security, privacy, digital graphics, cloud computing, and computer history. Here, we highlight recent issues of other Computer Society magazines.

Software

People hate to weed through an avalanche of spam in their inboxes just to get to the good stuff. We want notes from friends and family, important business documents, relevant information, critical notices, and valuable product offers. The rest of it can rot. Leo Hatton and Alan John, cofounders of SendForensics and authors of “Delivering Genuine Emails in an Ocean of Spam,” offer advice to companies about how to get customers to read their emails. Their philosophy forms the foundation of their company’s goals in developing new types of email deliverability, compliance, and security systems. Authentication protocols with big-sounding names—Transport Layer Security; DomainKeys Identified Mail; Sender Policy Framework; and Domain-Based Message Authentication, Reporting and Conformance—are already in place. Beyond that, companies must create consistently high-quality legitimate email. They also must send email that doesn’t just look pure but is actually pure. How? SendForensics has developed metrics that will analyze an email’s quality and purity. The software that does this combines forensic algorithms and statistical models built by continual analysis of large amounts of email over many years. In spite of the growth of social media and instant-messaging systems, email is still the preferred means of communication by industry. It behooves industry to make that email worth reading.

Internet Computing

Since 2014, Apple has provided seamless end-to-end encryption for its iMessage and FaceTime services. While its services are vulnerable to man-in-the-middle attacks and law enforcement requests, it is still enviable to digital giants like Google and Yahoo, which are developing their own similar approaches to email encryption. “iMessage remains perhaps the best usable covert communication channel available today if your adversary can’t compromise Apple,” say researchers who recently published “Balancing Security and Usability in Encrypted Email” in the May/June 2017 issue of IEEE Internet Computing. Between August 2015 and February 2016, researchers from the University of Maryland, Clemson University, and the University of New Mexico asked 52 mostly young male subjects which encryption model was easier to use: exchange or registration. Exchange requires users to create and then exchange locks with people each time they want to communicate. Registration requires users to register their locks publicly in a registry of other users. Because the registration model was the less tedious of the two, the participants found it considerably easier to use. They also expressed strong interest in exploring, using, and understanding the encryption models, giving providers even more incentive to make complex encryption processes easier to understand.

Because they are less likely to pursue computer science as a career or, at the very least, as a significant part of their high school and college coursework, women and minorities have become the latest subjects of study for researchers wanting to learn how to increase their interest in computer tech. An examination of UCLA’s Exploring Computer Science (ECS) program reveals some interesting results about how to inspire interest in computing as it relates to students’ future careers and how to increase enrollment among women and minorities in computer courses. Students from Greece, Germany, and Chicago public schools were questioned about their interest in computer science and how they felt about the ESC course. Surprisingly, stereotypes about the level of women’s interest in computing, how likely Asians are to pursue more courses in computing, and Hispanic and
African-American attitudes about the relevance of computing in their lives were all blown out of the water. Read more about the results of the study in the May/June 2017 issue of Computing in Science & Engineering.

The overwhelming majority of them continue to lead independent lives, even well past retirement age. Most elderly people continue to live in their own homes or, in some cases, a minimal care facility where they are provided with meals and housekeeping services. However, according to the US Centers for Disease Control and Prevention, the average 75-year-old has three chronic conditions and uses five different prescription drugs. As the number of elderly people continues to grow, researchers are looking for ways to improve health monitoring and care for senior citizens without requiring them to make constant trips to the doctor. Scientists at the University of Missouri have developed a healthcare platform called ElderCare-as-a-SmartService (ECaaS), which has two key components: (1) An in-home health alert system that gathers information from sensors that monitor the patient's movement throughout the house, changes in gait such as limping, and sleep patterns. This information allows doctors and therapists to analyze a patient's health and offer treatment remotely. (2) An in-home remote physical therapy application that allows physical therapists to use video to assess the patient's gait and balance, qualitatively and quantitatively. Read more about this new cloud-based service for the elderly in the May/June 2017 issue of IEEE Cloud Computing.

Thirty years ago, the first minimally invasive surgery was performed—the laparoscopic removal of a gallbladder. Since then, robotics have taken minimally invasive surgery to a new level. Through tiny incisions, surgeons can insert even smaller robotic instruments to perform surgical procedures with very little disruption to surrounding tissue. Recovery time is minimal, risk of infection is greatly reduced, and patients experience considerably less pain and scarring. Advances in robotic surgery techniques and equipment continue at an astonishing rate. However, until now, algorithms have not included haptic feedback—the ability for surgeons to "feel" tissue as they perform surgical cuts. The authors of "Efficient Surgical Cutting with Position-Based Dynamics," which appears in the May/June 2017 issue of IEEE CG&A, have introduced a skinning scheme that provides haptic feedback, especially for surgeons operating on soft, deformable tissue. Learn more about how their algorithm is making complex, delicate surgery more precise.
You might remember the Volkswagen emissions scandal from 2015 where Volkswagen was charged with violating clean air standards in cars they sold from 2008 to 2015. The company built emissions systems designed to pass emissions testing but that emitted up to 40 times more nitrous oxides into the air otherwise. Companies hate these kinds of scandals because they can injure a brand name and cut into profits for years. Companies that want to recover from such bad publicity need to pay attention to social media streams and the information they reveal about how the public feels about the scandal. Researchers who analyzed Internet chatter about the Volkswagen scandal found that while the predominant feeling toward the company was negative, consumers still had positive things to say about VW’s gearbox and seat quality. It takes a sophisticated algorithm to extract and analyze communications for this kind of information. Yet, companies need and want this information so they can plan and evaluate their corporate communications campaigns. Read more about how researchers are developing better methods for mining public knowledge bases to analyze consumer emotion in the May/June 2017 issue of IEEE Intelligent Systems.

For a long time, the conventional wisdom about tagging images was to use clear, precise words that interpret the picture exactly. For example, with the ubiquitous cat photo, you might use (cat, cats, kitten, cat lover, tabby). Pretty straightforward. However, researchers propose that personalized tags can produce better search queries and recommendations. For example, a user might give a cat photo the tags (monty, pet, buddy, cat, chum). Clearly, the terms have personal meaning and can speak to what the user might really want to see in advertising and search results. Researchers say the order in which the tags are ranked matter, too. Currently, most search engines offer no direct way to learn and personalize a user’s preferences. Read more about how to change that in the April–June 2017 issue of IEEE Pervasive Computing.

Historian Michael Mahoney has urged researchers to probe deeper into computer software’s past in order to “reveal the roots of that [PC] software in the earlier period.” The research can reveal just how much software’s history has established development practices, standards, computer groups, and associations. In response, Zbigniew Stachniak of York University in Canada suggests in his article “MCM and Personal Software,” appearing in the January–March 2017 issue of IEEE Annals, that researchers begin with the software policies adopted by the earliest PC makers—among them Micro Computer Machines (MCM). Explore the evolution of MCM’s view on software-shaped personal computing’s paradigm transformations.

Many of the major cities in Latin America face ongoing challenges of violence and economic inequality. That’s why researchers from Switzerland and Mexico have created SenseCityVity, a program to help the young citizens (high school students, ages 16–18) of Guanajuato, Mexico—one of the most important mining towns in the 16th century—define, document, and reflect on their city’s problems. Ten teams of ten members each were tasked with documenting the conditions of their city—many of which centered on piles of uncollected garbage, power lines installed too close to rooftops, vandalism, drugs, and insufficient transportation. As one participant noted, “Transport does not come in time or is very scarce, or things like that, which affect us [in getting] to school; this problem affects the majority of us.” Another participant said, “The problem here is that there is a lot of insecurity, in the alleys, outside the downtown area. At night, there are people drinking and smoking marijuana in the street alleys. We used to play by the Hidalgo market every day. But now we are limited because of insecurity; things can be complicated, and we are limited to go outside.” Read more about identifying and addressing the complex issues of those living in Latin American inner cities in the April–June 2017 issue of IEEE Pervasive Computing.

“In when we think of industry sectors driven by high tech... banking is not the first that comes to mind,” says Jennifer Q. Trelewicz of Deutsche Bank Technology Centre. However, there is no better industry that can benefit from big data technology, especially because of the sheer volume of data processed each day, the speed with which transactions should be made, and the various formats and data sources used by financial institutions. The New York Stock Exchange alone writes more than 1,000 gigabytes of data per day. How can this data be analyzed? How can market trends be predicted? Many banking systems are capable of processing 105 transactions per second. How can we make it faster? More efficient? Corporate banks use reference data, trade and market data, requests from clients, and many other sources coming in a variety of formats. How can big data algorithms be created that are compatible with all that? In her article “Big Data and Big Money: The Role of Data in the Financial Sector” appearing in the May/June 2017 issue of IT Pro, Trelewicz addresses these questions, outlining the challenges of big data in banking as well as future opportunities for technology development.
Researchers say that the “digital universe” will grow to more than 16 zettabytes in 2017. How much is that, you ask? Sixteen zettabytes is equal to more than 14.5 billion terabytes or 14.5 trillion gigabytes. And as big data and the Internet of Things grow, we will see an even greater explosion of data. This raises the question: Where will we store it all? The answer is DNA. A DNA storage system synthesizes DNA molecules to represent data and stores them in pools. To read the data, it selects molecules from the pool, amplifies them, and sequences them back to digital data. A single gram of DNA can hold 215 petabytes. Because of the impending limitations of silicon, researchers from Microsoft and the University of Washington formed the Molecular Information Systems Lab (MISL) to explore hybrid silicon and biochemical systems—such as DNA—as alternative storage systems with the capacity to store the never-ending deluge of information our digital society creates and distributes every day. Read more about their work in the May/June 2017 issue of IEEE Micro.