

ELSEWHERE IN THE CS

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Computer Highlights Society Magazines

The IEEE Computer Society's lineup of 12 peer-reviewed technical magazines covers cutting-edge topics ranging from software design and computer graphics to Internet computing and security, from scientific applications and machine intelligence to visualization and microchip design. Here are highlights from recent issues.

Computing in Science & Engineering

The Heat Equation: High-Performance Scientific Computing Case Study

High-performance computing and powerful supercomputers have recently become staples in many areas of academia and industry. The author of this article from the September/October 2018 issue of *Computing in Science & Engineering* introduces the concept of shared memory programming in the context of solving the heat equation, which would make it possible to explore several finite difference and parallelization schemes.

IEEE Annals of the History of Computing

How Atex Helped an Industry Change the World

Douglas Drane is one of three cofounders of Atex, a company that was an early dominant supplier of digital systems for newspaper and magazine publishers. In the July-September 2018 issue of *IEEE Annals of the History of Computing*, Drane recounts his memories of founding and operating Atex until it was acquired by Kodak.

IEEE Computer Graphics and Applications

ThunderPunch: A Bare-Hand, Gesture-Based, Large Interactive Display Interface with Upper-Body-Part Detection in a Top View

The authors of this article from the September/October 2018 issue of *IEEE Computer Graphics and Applications* present a new bare-hand, gesture-based interface for large-screen interaction. It allows multiple users to participate simultaneously and interact with virtual content directly. The cameras are mounted on the ceiling to avoid covering the large screen, unlike the conventional method in which the camera is placed in the front. To achieve bare-hand interaction in this hardware structure, the authors propose real-time algorithms that detect multiple body poses and recognize punching and touching gestures from top-view depth images. A test of pointing and touching shows that the proposed algorithm outperforms other algorithms. In addition, the authors created a game to best use the proposed system.

Intelligent Systems

Detecting Personal Intake of Medicine from Twitter

Mining social media messages such as tweets, blogs, and Facebook posts for health- and drug-related information has received significant interest in pharmacovigilance research. Researchers use social media websites to monitor drug abuse by searching for adverse reactions to drug usage and analyzing posters' sentiments related to drugs. Most of these studies are based on aggregated results from a large population rather than specific sets of individuals. To conduct studies at an individual level or in specific groups of people, it is necessary to identify posts that mention the user ingesting medicine. To reach this objective,

the authors of this article from the July/August 2018 issue of *IEEE Intelligent Systems* developed a classifier that identifies instances when the personal intake of medicine is mentioned in tweets. They trained a stacked ensemble of shallow convolutional neural network (CNN) models on an annotated data set and used a random search for tuning the hyperparameters of the CNN models. The classifier has direct applications in the areas of psychology, health informatics, pharmacovigilance, and affective computing.

Internet Computing

Real-Time Identity-Deception Detection Techniques for Social Media: Optimizations and Challenges

Highly effective methods to detect identity deception have been proposed for social-media platforms, but their efficiency can vary. Previous literature did not examine their potential to work as real-time monitoring systems, further highlighting the challenges of applying computationally intensive methods in online environments that involve large data sets and high data speeds. This article, which appeared in the September/October 2018 issue of *IEEE Internet Computing*, attempts to classify detection methods based on the approaches used and identifies factors that will impact their effectiveness and efficiency in real-time systems. The authors propose optimizations that can limit the computational overhead and discuss further challenges involving real-time identity-deception detection.

micro

Newton: Gravitating Towards the Physical Limits of Crossbar Acceleration

Recent works take advantage of the highly parallel analog in situ computation in memristor crossbars to accelerate the many vector-matrix multiplication operations in deep neural networks. However, these in situ accelerators have two significant shortcomings: the analog-to-digital converters (ADCs) account for a large fraction of chip power and area, and these accelerators adopt a homogeneous design in which every resource is provisioned for the worst case. By addressing both problems, a new architecture called *Newton* moves closer to achieving optimal energy per neuron for crossbar accelerators. In this article from the September/October 2018 issue of *IEEE Micro*, the authors introduce new techniques to apply at different levels of the tile hierarchy. Some leverage heterogeneity, and others rely on divide-and-conquer numeric algorithms to reduce computations and ADC pressure. For many CNN data flows and structures, *Newton* achieves

a 77% decrease in power, a 51% improvement in energy efficiency, and a 2.1× higher throughput/area, relative to the state-of-the-art, in situ analog arithmetic in crossbars accelerator.

MultiMedia

Digital Twins: The Convergence of Multimedia Technologies

Originally developed to improve manufacturing processes, digital twins are being redefined as digital replications of living and nonliving entities that enable data to be seamlessly transmitted between the physical and virtual worlds. Digital twins facilitate the means to monitor, understand, and optimize the functions of all physical entities and, for humans, to provide continuous feedback for improved quality of life and well being. Read more in the April-June 2018 issue of *IEEE MultiMedia*.

pervasive COMPUTING

Privacy-Preserving Incentive Mechanisms for Mobile Crowdsensing

The smartphone market has rapidly proliferated in recent years. Ubiquitous smartphones not only possess powerful computational capabilities but also contain various built-in sensors. Smartphones provide easy access to communication networks such as Wi-Fi and 3G/4G. They have become an important information interface between users and environments and could potentially constitute a huge mobile sensor network. These advances motivate researchers to propose mobile crowdsensing systems that could provide large-scale and complex social or geographical sensing applications. Read more in the July-September 2018 issue of *IEEE Pervasive Computing*.

SECURITY & PRIVACY

Privacy and Civilian Drone Use: The Need for Further Regulation

In an era of sophisticated audio/video and social media networks, current U.S. regulations cannot explicitly provide privacy protection for drone use. In 2016, the National Telecommunications and Information Administration recognized this deficit by releasing a set of best practices, which the authors examine in light of the current privacy concerns that come with drone use in the United States. Read more in the September/October 2018 issue of *IEEE Security & Privacy*.


Software Engineering Research and Industry: A Symbiotic Relationship to Foster Impact

Software engineering is not only an increasingly challenging endeavor that goes beyond the intellectual capabilities of any single individual engineer but also an intensely human one. Tools and methods to develop software are employed by engineers of varied backgrounds within a large variety of organizations and application domains. As a result, the variation in challenges and practices in system requirements, architecture, and quality assurance is staggering. Human, domain, and organizational factors define the context within which software engineering methodologies and technologies are to be applied. This article is part of the September/October 2018 issue of *IEEE Software* on software engineering's 50th anniversary. It assesses the current challenges faced by software

engineering research in achieving its potential, describes the root causes of such challenges, and proposes a way for the field to move forward and become more impactful through collaborative research and innovation between public research and industry.

IT Professional

The Evolving Payments Landscape: Technological Innovation in Payment Systems

Established financial institutions and their technology partners are making significant contributions for financial technology innovation in the payments market. This article, which appears in the March/April 2018 issue of *IT Professional*, provides a holistic overview of the technological innovations and challenges in the evolving payments landscape. 

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