Automotive Computing, Neuromorphic Computing, and Beyond

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Welcome to 2018 and *IEEE Micro*'s 38th year. I'm delighted about last year's issues. In addition to the traditional special issues on Hot Chips and Top Picks, we had special issues on cognitive architectures, architectures for the post-Moore era, Cool Chips and Hot Interconnects, and ultra-low-power processors. I deeply appreciate the efforts of everyone who reviewed the many articles submitted to the magazine last year. For a full list of 2017 reviewers and to find out how to get involved, visit publications.computer.org/micro/2018/01/12/reviewer-thanks-2017/. I hope you enjoyed reading last year's articles. Now, I'm excited to introduce you to the 2018 special issues.

This January/February issue covers automotive computing and is guest-edited by Hsien-Hsin Sean Lee (Taiwan Semiconductor Manufacturing Company, or TSMC) and Jason Clemens (Nvidia). The promise of improved safety and driving experience has led to a recent surge in advanced driver assistance system (ADAS) technology. Modern vehicles already feature ADAS to provide adaptive cruise control, automate braking, alert the driver to other cars or dangers, warn the driver about lane departure and blind spots, and so on. Combining advanced recognition and computer-vision technology with recent advances in machine learning will continue to create new possibilities in autonomous vehicles. Next-generation ADAS will increasingly leverage wireless network connectivity to further improve the automated driving experience through vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication. These advances in automotive computing will drastically increase the number of computing and communication devices deployed in autonomous vehicles. This special issue addresses some of the pressing issues in automotive computing. I invite you to read the editorial by the guest editors for a more detailed introduction to the four articles included in this special issue. I wholehearted thank Sean and Jason for having done such a great job on this special issue.

This issue also features an article by Mike Davies and colleagues about the Intel Labs Loihi neuromorphic many-core processor. Loihi is a 60-mm^2 chip fabricated in Intel's 14-nanometer process that advances the state-of-the-art modeling of spiking neural networks (SNNs) in silicon. In contrast to an artificial neural network (ANN), an SNN incorporates time as an explicit dependency in computation. The article describes the architectural requirements and the asynchronous design implementation of the Loihi chip.

This issue further includes two Expert Opinion articles. The first one, by Vijay Janapa Reddi and colleagues from Google, talks about the state of mobile computer architecture. The authors make the observation that, in spite of the unparalleled growth in mobile computing over the past dec-

Published by the IEEE Computer Society
0272-1732/18/$33.00 ©2018 IEEE

ade, little attention is awarded to mobile architecture research. The expert opinion provides recommendations for researchers in industry and academia to increase awareness in terms of mobile workloads, metrics, and experimental methodology. The second one, by Xing Hu and colleagues from the University of California, Santa Barbara, talks about the evolution in die stacking, or three-dimensional integrated circuits (3D ICs). Die stacking is a promising technology innovation aimed at reducing interconnect lengths, increasing memory bandwidth, integrating heterogeneous components, and reducing form factor. This expert opinion reviews past innovations in die stacking and offers a glimpse into its future.

This issue also includes a testimonial on the seminal paper by Bob Rau on "Iterative Modulo Scheduling," which was awarded the 2016 MICRO conference Test of Time award. The testimonial recognizes the big impact this paper had on the field.

Looking forward into 2018, the March/April issue will feature articles on selected designs from the Hot Chips conference held in Cupertino, California, in August 2017. Hot Chips is the annual conference where the most exciting and advanced microprocessor designs and projects in industry and academia are presented. *IEEE Micro* has a tradition of inviting the teams behind some of these designs to submit a paper to the March/April special issue.

In May/June, we have our annual Top Picks special issue, which selects the "most significant research papers in computer architecture based on novelty and potential for long-term impact." Thomas Wenisch (University of Michigan, Ann Arbor) is the guest editor of that issue and chairs the selection committee consisting of 32 experts from academia and industry. The committee received 111 submissions and will select the top dozen papers to recognize as Top Picks, along with another dozen papers to recognize as honorable mentions. The special issue will feature all of the Top Pick selections to highlight the work to the broader community.

Approximate computing is the theme of the July/August issue, which will be guest-edited by Natalie Enright Jerger (University of Toronto) and Joshua San Miguel (University of Wisconsin—Madison). Two major trends have spurred the interest in this new research avenue: (i) dark silicon and (ii) the growing interest in applications that are inherently probabilistic, imprecise, or noisy. Approximate computing seeks to trade off accuracy and precision for power and energy efficiency.

The September/October special issue will be devoted to memristor-based computing. Lizy K. John and Earl Swartzlander from the University of Texas at Austin will act as guest editors. The last issue of the year will feature hardware acceleration and will be guest-edited by Martha Kim (Columbia University) and Sophia Shao (Nvidia).

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In closing, I wish you and your family all the best in the new year, both professionally and personally! And, of course, I hope you enjoy reading *IEEE Micro* magazine in 2018!

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