

Machine Learning Accelerators and More

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■ **WELCOME TO THE** September/October 2019 issue of *IEEE Micro*, the much-awaited special issue on machine learning (ML) acceleration. I had promised in the beginning of 2019 that the year will not pass by without a special issue on the hot topic of ML acceleration. Here it is!

In recent years, ML has led to significant advances in many domains of modern life, whether it be medicine, finance, marketing, or autonomous driving. Neural networks have taken automation to an amazing level, whether it is supply chain optimizations or medical image processing. The tremendous advances in machine intelligence were made possible by two developments: first, affordable high performance computing, and, second, availability of large amounts of training data. Our community has contributed to the current ML revolution by creating affordable hardware that powers the myriad of ML applications. Computer architects and designers around the world are busy creating affordable and energy-efficient hardware to enable training of ML applications on big data and powering ML inference applications.

This special issue presents a collection of articles on ML accelerators to speed up ML both in training and inference. The topics discussed

range from analog and mixed-signal hardware, memory, and storage systems for acceleration, customizable accelerators, to compiler, and run-time tools for ML accelerators.

Prof. Hadi Esmaelizadeh of the University of California, San Diego, and Prof. Jongse Park of the Korea Advanced Institute of Science and Technology served as the guest editors for the special issue. The research community responded with enthusiasm to the call for papers. In total, 26 submissions were received, from which 11 articles were chosen to create this fantastic issue. A preview of the articles can be obtained from the comprehensive introductory message written by Professors Esmaelizadeh and Park.

The 11 articles from the ML acceleration theme are accompanied very appropriately by a Micro Economics column on ML-driven medical imaging by Shane Greenstein. In his article, “Earning Stripes in Medical Machine Learning,” Greenstein describes a startup named Zebra that uses a series of ML software to diagnose X-rays and CT-scans, for a cost of \$1 per scan. The software can analyze spinal fractures, brain bleeds, lung congestion, etc. Enjoy this article based on the close look of a small startup that employs ML to enhance medical diagnosis in a cost-effective way.

This issue also features a book review by Richard Mateosian. The article titled “What I Missed” reviews the book *The Code: Silicon*

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Valley and the Remaking of America by Margaret O'Mara (Penguin Press, NY, 2019, 506pp, ISBN: 9780399562181, <https://www.penguinrandomhouse.com>, 30.00). Mateosian describes the style of author Margaret O'Mara to be that of a historical storyteller. He relates the book to his own experiences in the Silicon Valley from when he arrived in Berkeley in 1963.

This issue additionally features an awards article based on the 2019 Eckert–Mauchly Award. Prof. Mark D. Hill of the University of Wisconsin-Madison, who received the 2019 Eckert–Mauchly award, delivered a heart-warming speech during ISCA in Phoenix, AZ, in June 2019. He also wrote an article largely based on his speech, presenting forward-looking advice on how to conduct research. The importance of picking a good research problem and steps in

hypothesis testing are described with multiple examples. My heart aches when I read that Mark's mother passed away the morning after he received the award.

IEEE Micro is interested in submissions on any aspect of chip/system design or architecture. Please consider submitting articles to *IEEE Micro* and remember, all regular articles will be eligible for the newly instituted best paper award, which will be given annually for the previous year's articles.

I am confident that readers will enjoy the variety of articles in this issue. Happy reading!

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