FROM THE EDITOR-IN-CHIEF

Top Picks Ignite Innovation

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This *IEEE Micro* Special Issue on Top Picks includes 12 outstanding papers selected from those published in 2023 computer architecture conferences. When we were prepping and putting together all the articles in this special issue, another significant event in the computer industry was unfolding in Taipei, Taiwan, in June: the 2024 COMPUTEX Taipei. The event hosted more than 1500 exhibitors from 136 countries and regions, showcasing the latest innovations and sleek products in information and computing technologies. Unparalleled to previous equivalent events, the 2024 COMPUTEX organizers invited an elite group of influential leaders from today's technology juggernauts to deliver keynotes. The program features AMD CEO Lisa Su, Delta Electronics General Director Tzi-cker Chiueh, Intel CEO Pat Gelsinger, MediaTek CEO Rick Tsai, NXP CTO Lars Reger, Qualcomm CEO Cristiano Amon, and Supermicro CEO Charles Liang. They were joined by a couple of additional speakers, ARM CEO Rene Haas and Nvidia CEO Jensen Huang, who delivered their keynotes outside the COMPUTEX exhibition hall. These Top Picks speakers represent the ecosystem companies of the computing infrastructure supply chain that help shape, bolster, and accelerate the Fourth Industrial Revolution, driven by the prevailing and unstoppable artificial intelligence (AI) tsunami. The unveiled systems push the frontiers of technology, reaching the pinnacle of computer architecture design, system integration, advanced packaging techniques, and leading-edge process technologies.

Streamlining the future envisioned by these industry leaders, state-of-the-art computing systems aimed at accelerating AI and their deployment were lined up one after another. These include AMD's Zen5 and XDNA2 NPU, MI325X, and MI350 announcement; Intel's Xeon 6 and Gaudi 3 AI accelerator; Nvidia's 700 AI TOPS RTX AI PC and a holistic AI service portfolio: Nvidia Inference Microservices; MediaTek's DaVinci generative AI platform for mobile devices; and Qualcomm's Snapdragon X Elite-based AI PC in collaboration with their laptop OEM partners. On the other hand, COMPUTEX Taipei was followed back to back by the much-anticipated Worldwide Developer Conference by Apple. Once again, generative AI models were under the spotlight, with Apple creating an interface for integrating large language models (LLMs) into applications running on Apple's devices. With the introduction of Apple Intelligence, there has been much speculation in the media about what capabilities and what LLMs from which vendors will be offered on their mobile devices, such as iPhones, iPads, and Macs.

The entire computing industry is celebrating with a grand gala as the hardware infrastructure, along with the software–hardware-system-technology co-design, undergoes an unprecedented transformation to rapidly interweave AI into everywhere and every aspect of life. A true, new Cambrian era of AI everywhere and its end-to-end AI services is on the horizon. These dynamics and transformative phenomena remind me of a visionary project at the Massachusetts Institute of Technology in the late 1990s: "Project Oxygen." The project started with an ambitious vision to make technology omnipresent yet invisible, like the oxygen we breathe in and out, and conceptually similar to the role AI technology will play in our future. Many believe that the ongoing technological revolution in AI will substantially boost our productivity, catalyze more creation, fundamentally solve humanity's most challenging problems, and create a better world for all of us.

For the past two decades, it has been a tradition for *IEEE Micro* to bring you the Top Picks papers in computer architecture conferences as a special issue. First and foremost, I extend my most sincere gratitude to Prof. Yan Solihin from the University of Central Florida for serving as the guest editor and Program Committee (PC) chair for the *IEEE Micro* Top Picks this year. Many would agree with me that being the chair of the IEEE Top Picks is one of the most challenging and demanding roles in our field. The PC of Top Picks often engages in contentious debates throughout the entire selection process. Although we all know it is never wise to predict the future, the Top Picks PC members also have to forecast which papers will stand out as the "best of the best" and make significant impacts in

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the years to come. This selection is laboriously made from a pool of papers published in top-tiered computer architecture conferences already known for their exceptional rigor and competitiveness.

THE EVENT HOSTED MORE THAN 1500 EXHIBITORS FROM 136 COUNTRIES AND REGIONS, SHOWCASING THE LATEST INNOVATIONS AND SLEEK PRODUCTS IN INFORMATION AND COMPUTING TECHNOLOGIES.

Prof. Solihin and his 36 PC experts selected 12 Top Picks papers and another 12 Honorable Mentions for this Special Issue. The topics of these papers, selected from the ACM International Conference on Architectural Support for Programming Languages and Operating Systems, IEEE/ACM International Symposium on Computer Architecture, and IEEE/ACM International Symposium on Microarchitecture (four from each), range from microarchitecture and data center architectures to domain-specific accelerators and secure hardware. The Top Picks papers are published in this issue, while summaries of the 12 Honorable Mentions are recognized in Prof. Solihin's Guest Editor message. There, you can also learn more about the paper selection process and the contributors who served on the Top Picks PC.

Following the Top Picks papers, we feature the regular Micro Law column from Dr. Joshua Yi and the Micro Economics column from Prof. Shane Greenstein. In Dr. Yi's sequel of his analysis of patent families, he further analyzes the number of total claims for single- and multipatent families as well as the implications and potential tactics adopted by different companies. Finally, Prof. Greenstein reflects on the creation and development and his personal learnings on one of the most adopted generative AI tools today, GitHub CoPilot, which is based on his interactions with GitHub and Microsoft employees.

I hope that you find the papers in this Special Issue on Top Picks enlightening, and that they shed light on future directions for computing system design.

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