

IEEE micro

The magazine for chip and silicon systems designers



7 GUEST EDITOR'S INTRODUCTION Special Issue on Environmentally Sustainable Computing

Carole-Jean Wu

JANUARY/FEBRUARY 2023

Theme Articles

9

Kaya for Computer
Architects: Toward
Sustainable
Computer Systems
Lieven Eeckhout

19

Sustainable AI
Processing at the Edge
Sébastien Ollivier, Sheng Li,
Yue Tang, Stephen Cahoon,
Ryan Caginalp, Chayanika Chaudhuri,
Peipei Zhou, Xulong Tang,
Jingtong Hu, and Alex K. Jones

29

Data Centers on
Wheels: Emissions
From Computing
Onboard
Autonomous
Vehicles
Soumya Sudhakar,
Vivienne Sze, and
Sertac Karaman

Special Issue on Cool Chips

Guest Editors' Introduction

40 Special Issue on Cool Chips

Ryusuke Egawa and Yasutaka Wada

Theme Articles

42 TCN-CUTIE: A 1,036-TOp/s/W, 2.72- μ J/ Inference, 12.2-mW All-Digital Ternary Accelerator in 22-nm FDX Technology

Moritz Scherer, Alfio Di Mauro, Tim Fischer, Georg Rutishauser, and Luca Benini

49 A Scalable Body Bias Optimization Method Toward Low-Power CGRAs

Takuya Kojima, Hayate Okuhara, Masaaki Kondo, and Hideharu Amano

Special Issue on Commercial Products 2022

Theme Articles

58 Enterprise-Class Multilevel Cache Design: Low Latency, Huge Capacity, and High Reliability

Deanna Berger, Christian Jacobi, Craig R. Walters, Robert J. Sonnelitter, Mike Cadigan, and Matthias Klein

67 Data Movement Accelerator Engines on a Prototype Power10 Processor

Yutaka Sugawara, Dong Chen, Ruud A. Haring, Abdullah Kayi, Eugene Ratzlaff, Robert M. Senger, Krishnan Sugavanam, Ralph Bellofatto, Ben J. Nathanson, and Craig Stunkel

Feature Article

76 RDMA Congestion Control: It Is Only for the Compliant

John Snyder, Alvin R. Lebeck, and Danyang Zhuo

Columns and Departments

From the Editor-in-Chief

4 Environmentally Sustainable Computing

Lizy Kurian John

Micro Law

83 Does Academic Research Drive Industrial Innovation in Computer Architecture?—Analyzing Citations to Academic Papers in Patents

Joshua J. Yi

Micro Economics

90 The Modern Digital Operating Model

Shane Greenstein

Also in This Issue

1 Masthead

89 IEEE Computer Society Info

©Shutterstock.com/
Happy Stock Photo

www.computer.org/micro

ISSN: 0272-1732