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Comments from the Editors

Dear ACM/SIGDA members,

We are excited to present to you the November e-newsletter. We encourage you to invite your students and colleagues to be a part of the SIGDA newsletter. The newsletter covers a wide range of information from the upcoming conferences and hot research topics to technical news and activities from our community. Get involved and contact us if you want to contribute an article or announcement.

The newsletter is evolving, let us know what you think.

Happy reading!

Debjit Sinha, Keni Qiu, Editors-in-Chief, SIGDA E-News

To renew your ACM SIGDA membership, please visit http://www.acm.org/renew or call between the hours of 8:30am to 4:30pm EST at +1-212-626-0500 (Global), or 1-800-342-6626 (US and Canada). For any questions, contact acmhelp@acm.org

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SIGDA News

(1) "AMD Confirms Rumored Acquisition of Xilinx"
[https://www.eetimes.com/amd-confirms-rumored-acquisition-of-xilinx/]

The confirmation of the Xilinx acquisition was piggybacked on AMD's regularly scheduled conference call to discuss its quarterly earnings. The company reported record revenue for the third quarter of $2.8 billion, up an even $1 billion from the like period in 2019, and up $900 million from the immediately preceding second quarter. Net income was $390 million, more than triple the $120 million logged in Q3 of 2019.

(2) "TSMC Sees HPC As Next Inflection Point"
[https://www.eetimes.com/tsmc-sees-hpc-as-next-inflection-point/]

Taiwan Semiconductor Manufacturing Co. (TSMC) expects the main driver of its growth in the next several years to be high-performance computing (HPC), overtaking its current smartphone business.

(3) "Nvidia Presents the DPU, a New Type of Data Center Processor"
[https://www.eetimes.com/nvidia-presents-the-dpu-a-new-type-of-data-center-proces...]

Nvidia announced a new type of processor, the data processing unit (DPU), essentially a network interface card (NIC) with built-in Arm CPU cores to offload and accelerate networking, storage, and security tasks which would previously have been done on another CPU. The DPU will eventually replace the NIC in data center systems.

(4) "Inphi Acquisition: Marvell Bets Growth on Cloud, 5G"
[https://www.eetimes.com/inphi-acquisition-marvell-bets-growth-on-cloud-5g/]

Marvell Technology Group confirmed Thursday it would buy Inphi Corp. in a cash-and-stock deal. The acquisition, estimated to be as much as $10 billion, is the second big chip M&A announced this week after AMD officially unveiled its plan to acquire Xilinx.

(5) "Europe Focuses on 6GHz Regulation, While Wi-Fi 7 Looms Beyond"
[https://www.eetimes.com/europe-focuses-on-6ghz-regulation-while-wi-fi-7-looms-be...]

European regulators have been coming under increasing pressure regarding the slow pace at which the necessary lower 6-GHz band for Wi-Fi and its successor, Wi-Fi 6E, has been made available in the region.

(6) "Data on the Edge: A Common Blind Spot in Industrial Security"
[https://www.eetimes.com/data-on-the-edge-a-common-blind-spot-in-industrial-secur...]

Data is increasingly transmitted across a hostile territory or stored at a network edge. Critical operational data or intellectual property needs to be protected in industrial, operational technology, and Internet of things (IoT) settings.

(7) "Flex Logix' Edge AI Accelerator Battles Nvidia on Price-Performance"
[https://www.eetimes.com/flex-logix-edge-ai-accelerator-battles-nvidia-on-price-p...]

Flex Logix has launched its InferX X1 AI accelerator chip for edge systems, claiming it outperforms the Nvidia Jetson Xavier on popular object detection model Yolo v3 by 30%. The chip, which will be sampling next quarter, has also been priced deliberately to encourage the widespread adoption of AI inference techniques in high-volume applications.

(8) "NXP Battery Management Systems Marry VWs' EV Platform"
[https://www.eetimes.com/nxp-battery-management-systems-marry-vws-ev-platform/]

NXP Semiconductors unveiled a major design win for its battery management systems on Tuesday at its developers' conference, "NXP Connect." The customer is Volkswagen, which will use the NXP system in its EV car platform called MEB (Modularer E-Antriebs-Baukasten).

(9) "6 Considerations for Integrating Sensors in Vehicles"
[https://www.eetimes.com/6-considerations-for-integrating-sensors-in-vehicles/]

At the closing session of the AutoSens Brussels 2020 virtual conference, a panel of experts debated the right sensor mix and how to make sure design never compromises safety — and vice versa.

(10) "ADI and Microsoft Enable Time-of-Flight Technology for 3D Imaging"
[https://www.eetimes.com/adi-and-microsoft-enable-time-of-flight-technology-for-3...]

Analog Devices (ADI) and Microsoft have teamed up to produce time-of-flight (ToF) 3D imaging solutions with the goal of providing greater accuracy regardless of scene conditions.

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"What is" Column

What is MSD-First Arithmetic for Arbitrary-Precision Iterative Compute?

Dr. He Li
Postdoc Research Associate
University of Cambridge, UK

The rise of domain-specific accelerators for applications in the HPC (high-performance computing) and AI (artificial intelligence) fields has shown a renewed interest in most-significant digit-first (MSDF) arithmetic. MSDF arithmetic has been a popular compute paradigm for several decades that allows concurrent computation and communication for energy-efficient designs of circuits and systems. The energy and area costly digit-parallel interconnections between arithmetic units are replaced with digit-serial connections [1].

Use of redundancy in the number representations in MSDF arithmetic reduces latencies between successive operations to small constants, thereby allowing parallel execution and pipelining at the digit-level. Consequently, propagation of carries is avoided, and the cycle time is precision-independent. Arbitrary-precision compute is simple to achieve using truncation via unbiased

rounding [2].

As a case study, many iterative algorithms feature a loop that converges to the result of interest. When employing conventional least-significant digit first (LSDF) arithmetic for such algorithms, this leads to a fundamental problem: if the result has not converged after iterating a while, we usually have no knowledge to whether run the algorithm for more iterations or terminate the computation and run the algorithm with more precise arithmetic [3]. Li et al. proposed a fundamentally new approach, named ARCHITECT (Arbitrary-precision Constant-hardware Iterative Compute) [3], to solve this problem by using MSDF arithmetic. A constant compute-area hardware can be used to calculate an arbitrary number of algorithmic iterations to arbitrary precision, with both precision and iteration count growing in lockstep [3]. Efficiency is achieved over their traditional LSDF arithmetic equivalents where the latter's precisions are either over- or under-budgeted for calculating a result to an accuracy.

In standard numerical iterative computation, low-significance digits (LSDs) of early approximants are generally unimportant, while high-significance digits (MSDs) of later approximants generally become stable over time. Therefore, further efficiency gains are achieved by inferring such superfluous digits within iterative calculations. Use of forward error analysis allows the inference of insignificant LSDs for stationary iterative methods [4]. The avoidance of calculating these digits is guaranteed not to affect the algorithm to converge. Exploitation of MSDF arithmetic additionally allows the inference of stable MSDs for stationary iterative methods, with the detection of identical digits in successive approximants and matrix conditioning [5].

In summary, modern computer arithmetic has entered an era of rapid development [6]. The increasing popularity of domain-specific accelerators drives a greater requirement for high performance and low-power computer arithmetic circuits and systems. We envisage a wide range of emerging applications that can be benefit from MSDF arithmetic with high impact, including AI inference engine, digital signal processing, approximate computing, and function evaluation etc.

[1] Milos D. Ercegovac, and Tomas Lang. Digital Arithmetic. Elsevier, 2004.
[2] Alexandre F. Tenca. Variable Long-precision Arithmetic (VLPA) for Reconfigurable Coprocessor Architectures. PhD dissertation, UCLA, 1998.
[3] He Li, James Davis, John Wickerson, and George A. Constantinides. ARCHITECT: Arbitrary-Precision Hardware with Digit Elision for Efficient Iterative Compute. IEEE Transactions on Very Large Scale Integration (VLSI) Systems 28, no. 2, pp. 516-529, 2019.
[4] He Li, James J. Davis, John Wickerson, and George A. Constantinides. Digit Elision for Arbitrary-accuracy Iterative Computation. IEEE 25th Symposium on Computer Arithmetic (ARITH), pp. 107-114. IEEE, 2018.
[5] He Li, Ian McInerney, James Davis, and George A. Constantinides. Digit Stability Inference for Iterative Methods Using Redundant Number Representation. IEEE Transactions on Computers, 2020.
[6] Honglan Jiang, Francisco J. H. Santiago, Hai Mo, Leibo Liu, and Jie Han. Approximate Arithmetic Circuits: A Survey, Characterization, and Recent Applications. Proceedings of the IEEE, 2020.

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Paper Submission Deadlines

ISCA' 21 – Int' l Symposium on Computer Architecture
Valencia, Spain
Deadline: Nov 24, 2020 (Abstracts due: Nov 19, 2020)
May 22 – 26, 2021
https://iscaconf.org/isca2021/

ISED' 21 – 10th Int' l Symposium on Embedded Computing & System Design
Kollam, India

Deadline: Jan 5, 2021
sMar 12-14, 2021
http://isedconf.org

TAU' 21 – ACM Int' l Workshop on Timing Issues in the Specification and Synthesis of Digital Systems
Monterey, CA
Deadline: Jan 9, 2021
Apr 8-9, 2021
http://www.tauworkshop.com

FCCM' 21 - The 29th IEEE International Symposium On Field-Programmable Custom Computing Machines
Orlando, FL
Deadline: Jan 11, 2021 (Abstracts due: Jan 4, 2021)
May 9 – May 12, 2021
https://www.fccm.org/

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Upcoming Conferences and Symposia

ICCAD' 20 – IEEE/ACM Int' l Conference on Computer-Aided Design
Virtual Conference
Nov 2-5, 2020
http://www.iccad.com

SLIP^2 - System-Level Interconnect Problems and Pathfinding (co-located with ICCAD 2020)
San Diego, CA
Nov 5, 2020
http://sliponline.org

WOSET'20 - Workshop on Open-Source EDA Technology (co-located with ICCAD 2020)
San Diego, CA
Nov 5, 2020
https://woset-workshop.github.io

HOST'20 – IEEE Int' l Symposium on Hardware-Oriented Security and Trust
Virtual Conference
Dec 7-11, 2020
http://www.hostsymposium.org

FPT'20 - Int'l Conference on Field-Programmable Technology
Virtual
Dec 7-11, 2020
http://icfpt.org

HiPC'20 – IEEE Int'l Conference on High Performance Computing, Data, And Analytics
Pune, India
Dec 16-19, 2020
http://www.hipc.org

iSES' 20 – IEEE Int' l Symposium on Smart Electronic Systems
Chennai, India
Dec 14-16, 2020

http://www.ieee-ises.org

ASP-DAC'21 - Asia and South Pacific Design Automation Conference
Virtual Conference
Jan 18-21, 2021
http://www.aspdac.com

HiPEAC'21: Int'l Conference on High Performance Embedded Architectures & Compilers
Budapest, Hungary
Jan 18-20, 2021
https://www.hipeac.net/2021/budapest

DATE'21 - Design Automation and Test in Europe
Grenoble, France
Feb 1-5, 2021
http://www.date-conference.com

ISSCC'21 – IEEE Int'l Solid-State Circuits Conference
San Francisco, CA
Feb 14-18, 2021
http://isscc.org

VLSID'21 – International Conference on VLSI Design & International Conference on Embedded Systems
Virtual Conference
Feb 20-24, 2021
http://embeddedandvlsidesignconference.org/

FPGA' 21 – ACM/SIGDA Int' l Symposium on Field-Programmable Gate Arrays
Virtual Conference
Feb 28-Mar 2, 2021
http://www.isfpga.org

ISPD' 21 – ACM Int' l Symposium on Physical Design (canceled)
Mar 21-24, 2021
http://www.ispd.cc

ISQED'21 - Int'l Symposium on Quality Electronic Design
Santa Clara, CA
Apr , 2021
http://www.isqed.org

RTAS'21 – 27th IEEE Real-Time and Embedded Technology and Applications Symposium
Nashville, USA
May 18-21, 2021
http://2021.rtas.org

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Best Paper Awards

Best Paper Awards at ISLPED 2020: ACM/IEEE International Symposium on Low Power Electronics and Design, http://www.islped.org/2020/index.php

"How to Cultivate a Green Decision Tree without Loss of Accuracy?", by Tseng-Yi Chen, Yuan-Hao

Chang, Ming-Chang Yang and Huang-Wei Chen.

Best Paper Awards at CODES + ISSS 2020: International Conference on Hardware/Software Codesign and System Synthesis, http://www.islped.org/2020/index.php

"Everything Leaves Footprints: Hardware Accelerated Intermittent Deep Inference", by Chih-Kai Kang, Hashan Roshantha Mendis, Chun-Han Lin, Ming-Syan Chen and Pi-Cheng Hsiu.

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SIGDA Partner Journal

Call for Papers for ACM TODAES Special Issue on Approximation Systems

The ACM Transactions on Design Automation of Electronic Systems (TODAES), the premier ACM journal in design and automation of electronic systems and a closer partner of SIGDA, has announced a Special Issue on "Approximation Systems." The submission deadline is December 16, 2020.

The special issue on Approximate Systems will explore state-of-the-art, open challenges and opportunities in applying approximate computing principles end-to-end across the compute stack. While showcasing the state-of-the-art, the special issue will focus on highlighting promising avenues and identifying current obstacles towards a holistic end-to-end application of approximate computing, including:
-- Cross-layer techniques, including programming languages to write specifications that expose nondeterminism or flexibility;
-- Compilation techniques into concrete implementations;
-- Hardware architectures that exploit nondeterminism exposed at the software layer, or which expose hardware correctness versus resource usage tradeoffs to the layers above;
-- New devices and circuits to implement architectures that exploit or expose nondeterminism and correctness versus resource usage tradeoffs.

You are invited to visit the TODAES homepage at https://dl.acm.org/journal/todaes, where you may read innovative work documenting significant research and development advances in electronic system design, emphasizing a computer science/engineering orientation. You are also invited to submit research in these areas, and theoretical analysis and practical solutions are welcome.

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Technical Activities

1. "RISC-V International Announces Agenda for the Third Annual RISC-V Summit"

The leading RISC-V conference will be held virtually this year, featuring keynotes, tutorials, exhibitions, networking opportunities and more...
[https://www.edacafe.com/nbc/articles/1/1791541/RISC-V-International-Announces-Ag...]

2. "Quantum Computing Ready for a Leap into the Real World"

As recently as two years ago critics said quantum computers weren't buildable. Today, there are already commercial customers of quantum technology...
[https://www.eetasia.com/quantum-computing-ready-for-a-leap-into-the-real-world/]

3. "Taking a Closer Look at Intel's Process Roadmap"

Somewhat limited improvements of client and server CPUs coupled with delays of new process technologies made Intel look pale. But being a large company has its perks and Intel's roadmap reveals a path to regaining market share and mind share...
[https://www.eetasia.com/taking-a-closer-look-at-intels-process-roadmap/]

4. "CEA-Leti Announces Collaboration with Intel to Advance Chip Design Through Cutting-Edge 3D Packaging Technologies"

What's new: CEA-Leti today announced a new collaboration with Intel on advanced 3D and packaging technologies for processors to advance chip design. The research will focus on assembly of smaller chiplets, optimizing interconnection technologies between the different elements of microprocessors, and on new bonding and stacking technologies for 3D ICs, especially for making high performance computing (HPC) applications...
[https://www.edacafe.com/nbc/articles/1/1793085/CEA-Leti-Announces-Collaboration-...]

Job Openings:
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1. University of Pennsylvania School of Engineering and Applied Science United States

Job Title: Faculty Position in Circuits and Computer Engineering

Description: The School of Engineering and Applied Science at the University of Pennsylvania is growing its faculty by 33% over a five-year period. As part of this initiative, the Department of Electrical and Systems Engineering is engaged in an aggressive, multi-year hiring effort for multiple tenure-track positions at all levels. Candidates must hold a Ph.D. in Electrical Engineering, Computer Engineering, Systems Engineering, or related area. The department seeks individuals with exceptional promise for, or proven record of, research achievement, who will take a position of international leadership in defining their field of study and who will excel in undergraduate and graduate education. Leadership in cross-disciplinary and multi-disciplinary collaborations is of particular interest. Prospective candidates in all areas are strongly encouraged to address large-scale societal problems in energy, transportation, health, agriculture, food and water, economic and financial networks, social networks, critical infrastructure, and national security. We are especially interested in candidates whose interests are aligned with the school' s strategic plan, https://www.seas.upenn.edu/about/penn-engineering-2020/ Diversity candidates are strongly encouraged to apply. Interested persons should submit an online application at https://www.ese.upenn.edu/faculty-staff/ and include curriculum vitae, research, teaching, and diversity statements, and at least three references. Review of applications will begin on January 4, 2021.

2. Indiana University Bloomington United States

Job Title: Assistant Professor in Computer Science

Description: The Luddy School of Informatics, Computing, and Engineering at Indiana University (IU) Bloomington invites applications for a tenure track assistant professor position in Computer Science to begin in Fall 2021. We are particularly interested in candidates with research interests in formal models of computation, algorithms, information theory, and machine learning with connection to quantum computation, quantum simulation, or quantum information science. The successful candidate will also be a Quantum Computing and Information Science Faculty Fellow supported in part for the first three years by an NSF-funded program that aims to grow academic research capacity in the computing and information science fields to support advances in quantum computing and/or communication over the long term. Applicants should have a demonstrable potential for excellence in research and teaching and a PhD in Computer Science or a related field expected before August

2021. Questions may be sent to sabry@indiana.edu.

3. University of Texas Austin College of Natural Sciences United States

Title: Assistant Professor in Quantum Science and Technology

Description: The University of Texas at Austin invites applications for multiple tenure-track Assistant Professor positions (subject to the availability of funding) to enhance its research programs in the general area of quantum materials and quantum information science. The candidates will have a home department in Physics or Computer Science. This hiring initiative focuses on two areas: (1) fundamentals and applications of quantum information, algorithms, systems and architectures, and (2) quantum materials, devices, and quantum simulation. The positions offer excellent start-up funds, salary, and laboratory space in a dynamic and highly interactive research environment. Please submit your application at apply.interfolio.com/79208 and include: a cover letter, a description of research accomplishments and current and future research plans (limited to 4 pages), a statement on teaching experience, goals, and philosophy, a Curriculum Vitae, and a list of publications. Candidates should indicate a preferred home department and are also required to request three letters of recommendation using the Interfolio website, which will email the referees with instructions to directly upload their letters of recommendation. Complete applications will be reviewed on an on-going basis beginning September 30, 2020. Applications received before November 30 will be given full consideration.

4. Hong Kong University of Science and Technology Hong Kong

Title: Faculty Positions in Computer Science and Engineering

Description: The Department of Computer Science and Engineering of HKUST (cse.ust.hk) is inviting applications for substantiation-track faculty openings at all levels of Professor, Associate Professor and Assistant Professor for the 2021-2022 academic year. We are looking for candidates with outstanding research record in all computer science and engineering areas, with priority given to candidates in research areas transcending one or more of the following areas: Artificial intelligence and data science, Computer architecture and systems, Information security and privacy, Software engineering and programming languages. Applications including a cover letter, a curriculum vitae (including the names and contact information of at least three referees), a research statement and a teaching statement (all in PDF format) should be sent as attachments through e-mail to csrecruit@cse.ust.hk. Priority will be given to applications received by Tuesday, 15 December 2020. Applicants will be promptly acknowledged through e-mail upon receiving the electronic application material. Applications will be processed immediately when they are received and interviews will be arranged for shortlisted applicants.

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Notice to Authors

This newsletter is a free service for current SIGDA members and is added automatically with a new SIGDA membership.
Circulation: 2,700