Special Interest Group on Design Automation
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SIGDA - The Resource for EDA Professionals

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SIGDA News

1. US Pulls Back on CHIPS Act R&D Funding

The US government has canceled the latest round of funding for R&D under the CHIPS Act as it is oversubscribed.

2. Micron says US CHIPS money will underpin US$50 billion spend

US $6.1 billion in funding from the US government, under the CHIPS and Science Act, is set to support US$50 billion spending by Micron in Idaho and New York across the period to 2030.

3. TSMC Plans 1.6nm Process for 2026

TSMC is planning a 1.6nm process, called A16, for production in 2026 alongside a wafer-scale chiplet substrate and an automotive chiplet process.

4. TSMC Trims Semiconductor, Foundry Forecast for 2024

TSMC has lowered its 2024 forecasts for the chip market and foundry sector but maintained a strong growth prediction for itself on the strength of AI demand.

5. ASML has started shipping second high-NA EUV litho machine

The US government has canceled the latest round of funding for R&D under the CHIPS Act as it is oversubscribed.

Messages from the EiCs

Dear ACM/SIGDA members,

We are excited to present to you May 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 to technical news and activities of our community. Get involved and contact us if you want to contribute articles or announcements.

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

Happy reading!

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

6. [Synopsys drives 2nm analog IP, photonics with TSMC]

Synopsys and TSMC are developing an end-to-end electronic and silicon photonics reference flow alongside developing analog IP on TSMC's 2nm process technology.

What is

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What is Quantum Computing?

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Quantum computing represents a profound shift in the field of computation, harnessing the peculiar and powerful properties of quantum mechanics to solve problems that are currently intractable for classical computers. At its core, quantum computing departs from classical computing through its use of quantum bits, or qubits, instead of the traditional bits. In classical computing, a bit must be in one of two states, 0 or 1. However, qubits can exist simultaneously in multiple states thanks to superposition, a principle of quantum mechanics. This allows quantum computers to process a vast number of possibilities simultaneously [1]. Another key principle of quantum computing is entanglement. When qubits become entangled, the state of one (whether it's on or off) can depend on the state of another, no matter how far apart they are [2]. This property is used to link qubits in a quantum computer, enabling them to solve complex problems more efficiently than classical computers.

Quantum computers could potentially break many of the cryptographic systems currently in use. Conversely, they are also paving the way for quantum encryption methods that are far more secure than their classical counterparts. By modeling molecular structures with unprecedented accuracy, quantum computers could accelerate the discovery of new drugs and treatments [3]. Quantum algorithms, such as the quantum approximate optimization algorithm (QAOA), are well-suited for handling optimization challenges across logistics, manufacturing, and service industries, where they can potentially find the best solutions faster than classical algorithms [4]. Moreover, Quantum computing could provide a

significant boost to machine learning models by handling problems with large datasets and high complexity more efficiently [5].

Quantum computing has attracted significant research interest in recent years, particularly as we are still in the Noisy Intermediate Scale Quantum (NISQ) era [6]. However, numerous challenges must be addressed before quantum computing can benefit the real world. For instance, to solve the connectivity issues prevalent in most quantum systems, multiple qubit mapping and compilation frameworks have been proposed, including Sabre [7], FPQA-C [8], etc. Additionally, methods such as circuit architecture search [9], circuit synthesis [10], and quantum optimal control [11] have been designed to ensure gate and circuit fidelity. Furthermore, the high levels of noise in the quantum environment severely affect the reliability of quantum algorithms. As a response, strategies like quantum error mitigation [12] and quantum error correction [13] have been developed to shield quantum programs from noise. Moreover, given the current limitations in quantum computational power, researchers are seeking better solutions for practical applications by integrating classical optimization and machine learning techniques. For example, CSVQE [14] and SpacePulse [15] partition the problem Hamiltonian into a classically solvable part and a section that requires feedback from the quantum computer. Graph learning is also being used to 'warm-start' quantum algorithms [16], enhancing their efficiency and effectiveness.

In summary, quantum computing is a groundbreaking approach to computation, utilizing the unique principles of quantum mechanics to tackle problems that are currently infeasible for classical computers. Its main limitation lies in the nascent stage of its technology, which includes challenges such as qubit coherence times and high error rates. Significant efforts are needed to improve the stability of qubits and to develop scalable quantum systems that can be applied across different industries. As research progresses, quantum computing holds the potential to revolutionize fields such as cryptography, drug discovery, optimization problems, and artificial intelligence.

References

[1] Steane, Andrew. "Quantum computing." Reports on Progress in Physics 61.2 (1998): 117.

[2] Jozsa, Richard, and Noah Linden. "On the role of entanglement in quantum-computational speed-up." Proceedings of the Royal Society of London. Series A: Mathematical, Physical and Engineering Sciences 459.2036 (2003): 2011-2032.

[3] Blunt, Nick S., Joan Camps, Ophelia Crawford, Róbert Izsák, Sebastian Leontica, Arjun Mirani, Alexandra E. Moylett et al. "Perspective on the current state-of-the-art

Xun Jiao,
AE for What is

Muhammad Shafique,
AE for What is

Rajsaktish Sankaranarayanan,
AE for Researcher spotlight

Xin Zhao,
AE for Paper submission

Ying Wang,
AE for Technical activities

Jiaqi Zhang,
AE for Technical activities

Paper Deadlines

ICCAD'24 – IEEE/ACM Int'l Conference on Computer-Aided Design
New Jersey
Deadline: May 5, 2024 (Abstracts due: Apr. 28, 2024)
Oct/Nov, 2024
https://iccad.com/

ICCD'24 – IEEE Int'l Conference on Computer Design
Milan, Italy
Deadline: May 12, 2024 (Abstracts due: May 5, 2024)
Nov. , 2024
http://www.iccd-conf.com

MLCAD'24 - ACM/IEEE Workshop on Machine Learning for CAD
Snowbird, Utah
Deadline: May 18, 2024
Sep. 9-11, 2024
https://mlcad-workshop.org/

of quantum computing for drug discovery applications." Journal of Chemical Theory and Computation 18, no. 12 (2022): 7001-7023.
[4] Zhou, Leo, Sheng-Tao Wang, Soonwon Choi, Hannes Pichler, and Mikhail D. Lukin. "Quantum approximate optimization algorithm: Performance, mechanism, and implementation on near-term devices." Physical Review X 10, no. 2 (2020): 021067.
[5] Biamonte, Jacob, Peter Wittek, Nicola Pancotti, Patrick Rebentrost, Nathan Wiebe, and Seth Lloyd. "Quantum machine learning." Nature 549, no. 7671 (2017): 195-202.
[6] Preskill, John. "Quantum computing in the NISQ era and beyond." Quantum 2 (2018): 79.
[7] Li, Gushu, Yufei Ding, and Yuan Xie. "Tackling the qubit mapping problem for NISQ-era quantum devices." In Proceedings of the Twenty-Fourth International Conference on Architectural Support for Programming Languages and Operating Systems, pp. 1001-1014. 2019.
[8] Wang, Hanrui, Pengyu Liu, Bochen Tan, Yilian Liu, Jiaqi Gu, David Z. Pan, Jason Cong, Umut Acar, and Song Han. "FPQA-C: A Compilation Framework for Field Programmable Qubit Array." arXiv preprint arXiv:2311.15123 (2023).
[9] Liang, Zhiding, Jinglei Cheng, Hang Ren, Hanrui Wang, Fei Hua, Zhixin Song, Yongshan Ding et al. "NAPA: intermediate-level variational native-pulse ansatz for variational quantum algorithms." IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (2024).
[10] Shende, Vivek V., Stephen S. Bullock, and Igor L. Markov. "Synthesis of quantum logic circuits." In Proceedings of the 2005 Asia and South Pacific Design Automation Conference, pp. 272-275. 2005.
[11] Cheng, Jinglei, Haoqing Deng, and Xuehai Qian. "Accqoc: Accelerating quantum optimal control based pulse generation." In 2020 ACM/IEEE 47th Annual International Symposium on Computer Architecture (ISCA), pp. 543-555. IEEE, 2020.
[12] Zhiding Liang, Zhepeng Wang, Junhuan Yang, Lei Yang, Yiyu Shi, and Weiwen Jiang. "Can noise on qubits be learned in quantum neural network? a case study on quantumflow." In 2021 IEEE/ACM International Conference On Computer Aided Design (ICCAD), pp. 1-7. IEEE, 2021.
[13] Das, Poulami, Aditya Locharla, and Cody Jones. "Lilliput: a lightweight low-latency lookup-table decoder for near-term quantum error correction." In Proceedings of the 27th ACM International Conference on Architectural Support for Programming Languages and Operating Systems, pp. 541-553. 2022.
[14] Kirby, William M., Andrew Tranter, and Peter J. Love. "Contextual subspace variational quantum eigensolver." Quantum 5 (2021): 456.
[15] Liang, Zhiding, Zhixin Song, Jinglei Cheng, Hang Ren, Tianyi Hao, Rui Yang, Yiyu Shi, and Tongyang Li. "SpacePulse: Combining Parameterized Pulses and Contextual Subspace for More Practical VQE." arXiv preprint arXiv:2311.17423 (2023).
[16] Liang, Zhiding, Gang Liu, Zheyuan Liu, Jinglei Cheng, Tianyi Hao, Kecheng Liu, Hang Ren et al. "Graph Learning for Parameter Prediction of Quantum Approximate Optimization Algorithm." arXiv preprint arXiv:2403.03310 (2024).

iSES'24 – IEEE Int'l Symposium on Smart Electronic Systems
Ahmedabad, India
Deadline: May 31, 2024
Dec. 16-18, 2024
http://www.ieee-ises.org

HiPC'24 – IEEE Int'l Conference on High Performance Computing, Data, And Analytics
Bengaluru, India
Deadline: June 26, 2024 (Abstracts due: June 19, 2024)
Dec. 18-21, 2024
http://www.hipc.org

ASP-DAC'25 - Asia and South Pacific Design Automation Conference
Tokyo Odaiba Miraikan, Japan
Deadline: July 12, 2024 (Abstracts due: July 5, 2024)
Jan. 20-23, 2025
http://www.aspdac.com

ISED'24 – Int'l Conference on Intelligent Systems and Embedded Design
NIT Rourkela, Odisha
Deadline: Aug. 15, 2024
Dec. 20-22, 2024
http://isedconf.org

Upcoming Conferences

HOST'24 – IEEE Int'l Symposium on Hardware-Oriented Security and Trust
Washington DC
May 6-9, 2024
http://www.hostsymposium.org

SIGDA Partner Journal

ACM Transactions on Design Automation of Electronic Systems, TODAES, publishes innovative work documenting significant research and development advances on the specification, design, analysis, simulation, testing, and evaluation of electronic systems, emphasizing a computer science/engineering orientation. Design automation for machine learning/AI and machine learning/AI for design automation are very much welcomed.

TODAES would like to recognize the following for being part of our Distinguished Review Board.

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- Hamed Farbeh (Amirkabir University of Technology)
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- Renan Netto (Federal University of Santa Catarina)
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- Santosh Vishvakarma (Indian Institute of Technology Indore)
- Qilin Zheng (Duke University)

If you are an active researcher in the design and design automation field and would like to be part of the TODAES review board, please fill out the following reviewer form. TODAES recognizes those reviewers that provide timely and high-quality reviews through the Distinguished Review Board. TODAES also recognizes papers and outstanding junior researchers through best paper and rookie of the year award. Authors can send their paper submissions on the manuscript portal.

TODAES welcomes special issue proposals from leading researchers/practitioners. Such proposals should be emailed to Joerg Henkel, Senior Associate Editor, at joerg.henkel@kit.edu.

Technical Activities

1. Intel Paints Their AI Future with Gaudi 3

At its Vision event in Phoenix, Arizona, this week, Intel announced their third-generation data center AI accelerator, Gaudi 3. In so doing, Intel is

FCCM' 24 - IEEE International Symposium On Field-Programmable Custom Computing Machines
Orlando, FL
May 5-8, 2024
https://www.fccm.org/

MDTS'24 – IEEE Microelectronics Design & Test Symposium
Albany, NY
May 13-15, 2024
http://natw.ieee.org

RTAS'24 - IEEE Real-Time and Embedded Technology and Applications Symposium
Hong Kong, China
May 13-16, 2024
http://2024.rtas.org

MDTS'24 – IEEE Microelectronics Design & Test Symposium
Albany, NY
May 13-15, 2024
http://natw.ieee.org

ISCAS'24 – IEEE Int'l Symposium on Circuits and Systems
Singapore
May 19-22, 2024
http://iscas2024.org

IWLS'24 - International Workshop on Logic & Synthesis
ETH Zurich, Zurich, Switzerland
June 6-7, 2024
https://www.iwls.org

GLSVLSI'24 – ACM Great Lakes Symposium on VLSI
Tampa Bay Area, FL
June 12-14, 2024
http://www.glsvlsi.org

DAC'24 – Design Automation Conference
San Francisco, CA
June 23-27, 2024
http://www.dac.com/

painting a future AI accelerator competitive landscape with three viable options: itself, AMD and, of course, Nvidia…

2. Hybrid Quantum Computing Systems Are Delivering Value Now

As industries worldwide face unprecedented computational demands, quantum computing has emerged as a critical technology. Hybrid quantum computing is already at the forefront of practical, scalable solutions, addressing complex problems that have been beyond the reach of classical computers alone. The hybrid approach marries the reliability of classical computing infrastructure with the problem-solving prowess of quantum technology, offering an operational framework that businesses can utilize right now…

3. Diamond Breakthroughs Shape Future of High-Performance Electronics

Diamond, renowned for its exceptional properties, has long held promise for various applications, yet its potential as a semiconductor has faced hurdles hindering commercialization. Recent strides made by Advent Diamond have tackled critical technical challenges—notably, by fabricating single-crystal diamond doped with phosphorus to create n-type layers…

Job Positions

1. Polytechnique Montreal, Canada

Job Title: Professor of Cybersecurity

Description: The Department of Computer and Software Engineering of Polytechnique Montréal is experiencing significant growth and is seeking exceptional applicants to fill this position at the Assistant, Associate or Full Professor level. To complement its team of professors, the Department seeks candidates whose main research activities and interests are in the field of data security or cyber-resilience for intelligent connected systems. The new hired will have the possibility to join the IVADO community and contribute to a paradigm shift for AI and its adoption. They may also be considered for an IVADO professorship, which offers enhanced start-up conditions. IVADO is an interdisciplinary, cross-sectoral research, training and knowledge mobilization consortium whose mission is to develop and promote a robust, reasoning and responsible artificial intelligence (R3AI), through an ambitious project for which a major grant has been awarded recently by the Canada First Research Excellence Fund. More information

OSCAR'24 - Second Workshop on Open-Source Computer Architecture Research
Buenos Aires, Argentina (co-located with ISCA 2024)
June 29, 2024
https://oscar-workshop.github.io/

ISVLSI'24 – IEEE Computer Society Annual Symposium on VLSI
Knoxville, TN
July 1-3, 2024
http://www.ieee-isvlsi.org

ICECET'24 - IEEE International Conference on Electrical, Computer and Energy Technologies
Sydney, Australia
July 25-27, 2024
www.icecet.com

ISLPED'24 – ACM/IEEE Int'l Symposium on Low Power Electronics and Design
Newport Beach, CA
Deadline: Mar. 11, 2024 (Abstracts due: Mar. 4, 2024)
Aug. 5-7, 2024
http://www.islped.org

RTCSA'24 - The 30th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications
Sokcho, South Korea
Aug. 21-23, 2024
https://rtcsa2024.github.io/

ESWEEK'24 - Embedded Systems Week
Raleigh, NC
Deadline: Mar. 31, 2024 (Abstracts due: Mar. 24, 2024)
Sept. 29 - Oct. 4, 2024
http://www.esweek.org

can be found at https://facultyvacancies.com/professor-of-cybersecurity,i38463.html.

2. Lund University, Sweden

Job Title: Professor of Computer Science

Description: We are looking for a person with broad knowledge in the field and preferably with industrial experience. Subject description: Distributed Systems focuses on how to program software systems on top of different kinds of computer networks, including mobile and dynamically changing networks, so that the systems become secure, robust, efficient, scalable, and flexible, and so that the systems become simple to construct and modify. The area includes: Software architectures and high-level programming for distributed systems; Support for robustness so that systems can handle interruptions in communication, failuring devices, and mobile devices; Software architectures to support security and privacy in distributed systems; Utilization of artificial intelligence to automatically optimize system performance and support automatic reconfiguration of systems. Work duties include: Research within the subject area; Teaching in the first, second and third cycles of studies; Supervision of degree projects and doctoral students; Actively seeking external research funding. Collaboration with industry and wider society; Administration related to the work duties listed above. For more information, please refer to https://facultyvacancies.com/professor-of-computer-science,i38571.html.

3. ETH Zurich, Switzerland

Job Title: PhD Position in Computer Science

Description: We look forward to receiving your online application including: CV, full transcripts from undergraduate studies (both Bachelor and Master), a brief (1-page) motivation letter, at least 2 names of referees (with email addresses and phone numbers). Review of applications will begin on March 31, 2024 and continue until the position is filled. Applications should be submitted through our online portal. For more information, please refer to https://facultyvacancies.com/phd-position-in-computer-science,i38546.html.

VLSI-SoC'24 – IFIP/IEEE Int'l Conference on Very Large Scale Integration
Tanger, Morocco
Oct. 6-9, 2024
http://www.vlsi-soc.com

PACT'24 - Int'l Conference on Parallel Architectures and Compilation Techniques
Long Beach, CA
Oct. 13-16, 2024
http://www.pactconf.org

MICRO'24 – IEEE/ACM Int'l Symposium on Microarchitecture
Austin, Texas
Nov. 2-6, 2024
http://www.microarch.org/micro57

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