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.
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

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.

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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


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**Paper Deadlines**

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/


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.

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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
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 inter-disciplinary, 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...
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, failing 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](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](https://facultyvacancies.com/phd-position-in-computer-science.i38546.html).

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