Message from the Chairs

2023 IEEE International Conference on Quantum Computing and Engineering

It is our distinct pleasure and honor to welcome you all to the Fourth *IEEE International Conference on Quantum Computing and Engineering* (QCE23), also known as IEEE Quantum Week 2023. With your outstanding contributions and participation, QCE23 offers valuable opportunities to interact with experts in a full range of quantum technologies, from quantum device engineering to quantum computing and applications.

From its beginning, IEEE Quantum Week has worked on enabling a meaningful exchange of ideas to broaden the quantum community through networking with peers and exploring partnerships among industry, government, and academia. With participants from across the globe, we are confident that the insights shared and discussions held will lead to groundbreaking advancements and foster meaningful connections among peers.

We are pleased to hold IEEE Quantum Week 2023 as an in-person conference with the option of remote participation. We have therefore arranged for almost all 2023 IEEE Quantum Week events to be offered using the RD Mobile virtual platform. This platform allows virtual attendees from around the world to participate in real-time, interacting with on-site attendees and presenters. In addition, all streamed content will be recorded and will be available as QCE23 on-demand to all registered attendees through the end of 2023.

Throughout the program, you will have the privilege to engage with distinguished keynote speakers, quantum experts, and thought leaders who will share their deep understanding, insights, and perspectives. Additionally, a diverse array of workshops, panel discussions, and paper presentations will showcase cutting-edge research and initiatives, empowering you with new viewpoints and ideas.

QCE23 features 14-15 parallel tracks per day over six days, including 9 keynotes by world-class speakers, 32 community-building workshops, 30 workforce-building tutorials, 153 technical papers, 13 stimulating panels, 93 innovative posters, and 4 thought-provoking Birds of Feather (BoF) sessions.

One of the pillars of IEEE Quantum Week 2023 is the Exhibits. You have the chance to engage with Exhibitors and Poster presenters who showcase a diverse representation of the worldwide quantum landscape. Our 40+ exhibitors, sponsors, and supporters reach across academia, industry, and government research. For the first time this year, QCE will also feature a Quantum Career Fair.

Our keynote program features nine outstanding speakers from industry, academia, and research labs. The plenary keynote sessions in the morning and evening frame the rigorous daily program agendas, offering insights into the latest progress and potential for quantum technologies and applications.

The technical papers program is organized into five tracks: (1) Quantum Applications (QAPP), (2) Quantum Algorithms (QALG), (3) Quantum Systems Software (QSYS), (4) Quantum Networking and Communications (QNET), and (5) Quantum Computing Hardware Engineering (QTEM). QCE23 received 293 technical paper submissions – a 100% increase over 2022. More than 45% of the submitted papers had at least one author from industry or government laboratories. Papers were submitted by authors from 25 countries – attesting to the international reach of the conference and the quantum research community. Each paper track had its own program committee, managed by two track co-chairs. Each paper received at least three reviews from 151 international program committee members. Based on the reviews and further discussion, 153 papers were selected for presentation.

If you are new to the quantum experience, we are delighted to have you onboard. The Tutorials Program offers newcomers different entry points to the quantum realm and, at the same time provides introductions to different technologies across the quantum stack and quantum applications.

The community-building workshops are a fundamental pillar of IEEE Quantum Week. In the past four years, unique communities have formed from the QCE workshops, maintaining collaborations even between Quantum Week events. Out of the 32

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workshops, seven workshops had a paper track which accepted a total of 47 papers.

Our expert panels provide attendees with the unique opportunity to hear insights and perspectives directly from industry leaders and seasoned professionals. Not only does it offer a deeper understanding of nuanced topics, but it also sparks engaging discussions, stimulates new ideas, and presents a rare chance to interact with and pose questions to some of the brightest minds in the field.

QCE23 received a record number of 116 Poster submissions, including several from high school students. The Posters program committee selected 93 Posters for presentation in the Exhibits space at IEEE Quantum Week 2023. Posters will be featured in the proceedings with 2-page abstracts.

IEEE Quantum Week also features the 2nd Quantum Science and Engineering Education Conference (QSEEC). In this two-day collocated event, education researchers and practitioners come together to discuss methodologies for quantum curriculum and tool development for instruction and teaching.

One of the QCE23 highlights is the Panel entitled "Quantum LeapIdeas into Practice: Conversations with IEEE Computer Society Major Award Recipients." It is a distinct honor for IEEE Quantum Week to have been selected as the host for the 2023 IEEE Computer Society Major Awards Gala.

QCE23 received submissions from 40 countries. 286 program track committee members conducted more than 1,800 reviews. The QCE23 Proceedings have been arranged into three volumes this year. Volume 1 contains the contributions from the five technical paper tracks. Volume 2 includes the workshop papers, the 2-page poster papers, as well as keynote, panel, tutorial, and workshop abstracts. Volume 3 comprises the contributions of the 2nd Quantum Science and Engineering Education Conference (QSEEC).

Diversity and Inclusion (D&I) are central to the goals of the IEEE International Conference on Quantum Computing & Engineering (QCE) and its activities. Equity at its heart is about removing barriers, biases, and obstacles that impede equal access and opportunity to succeed. Diversity is fundamentally about valuing human differences and recognizing diverse talents. Inclusion is the active engagement of Diversity and Equity.

IEEE Quantum Week adheres to IEEEs Diversity Statement. IEEEs mission to foster technological innovation and excellence to benefit humanity requires the talents and perspectives of people with different personal, cultural, and disciplinary backgrounds. IEEE is committed to advancing diversity in the technical profession, and to promoting an inclusive and equitable culture in its activities and programs that welcomes, engages and rewards those who contribute to the field without regard to race, religion, gender, disability, age, national origin, sexual orientation, gender identity, or gender expression.

QCE follows and implements the D&I Best Practices advocated by the IEEE Computer Society. The IEEE Computer Society is committed to Diversity and Inclusion (D&I) across all its sponsored activities, including conferences. IEEE Computer Society encourages all conference organizers to promote and facilitate greater diversity and inclusion in their activities. We are deeply indebted to many people for their help and support in orchestrating QCE23. First, we would like to thank all the contributorsthe keynote speakers, the technical paper and poster authors, the workshop organizers, the tutorial presenters, the panel organizers and panelists, and the BoF orchestrators. We especially would like to thank the exhibitorsthe Diamond, Platinum, Gold, Silver, Bronze sponsors and patrons, and the supporters for their financial, technical, and in-kind contributions.

Second, we would like to thank all attendees who registered for QCE23. Your enthusiasm and appreciation of the speakers and the program make it all worthwhile. After two years of meeting each other virtually, it was a wonderful experience to finally interact in-person in Broomfield, Colorado. We will have a record attendance at the Hyatt Regency Bellevue on Seattle's Eastside this year. We are already working on QCE24, which will be held in Montral, Qubec, Canada. Please continue to provide feedback on how you are enjoying IEEE Quantum Week, as well as your ideas on how to improve the conference in the future.

Third, we thank all technical program track chairs and committee members, who conducted the review process under the leadership of the Technical Program Board Co-Chairs Yuri Alexev and Andrea Delgado. We also thank the co-chairs and reviewers of the workshop, tutorial, poster, and panel tracks for their dedication and innovative ideas in soliciting proposals. We thank publications chair the Scott Koziol for liaising with Computer Society Conference Publications Services team for the proceedings. The track co-chairs and committee members are enumerated and recognized on the QCE23 Committee pages

below in detail. Finally, we are indebted to the union of the IEEE Quantum Week Steering Committee and the IEEE Quantum Initiative Steering Committee for their extensive contributions, feedback, and support in the weekly conference calls over the past twelve months. These folks greatly shaped the structure and format of IEEE Quantum Week.

We are deeply indebted to all the IEEE staff who worked tirelessly over the last year (and more!) in bringing IEEE Quantum Week 2023 to fruition. First, we thank Kathy Grise, Terence Martinez, Andrea Sadlowski, and Bill Tonti, IEEE Quantum and IEEE Future Directions, for their dedicated support. Kathy, Terence, and Andrea orchestrated our weekly conference calls, and liaised with all the IEEE Societies and organizational units sponsoring IEEE Quantum Week. We thank all the staff at IEEE, IEEE Future Directions, and the different sponsoring societies, councils, and organizational units for promoting IEEE Quantum Week in their respective channels.

We especially commend the staff of IEEE Computer Society, the official QCE23 Conference Management Organization, for their superb help and support throughout the entire journey of IEEE Quantum Week. First, we would like to thank our outstanding meeting planner, Carmen Saliba, for her outstanding project management skills, her attention to details, and for looking after IEEE Quantum Week and its volunteers. She conducted all our contract negotiations with the hotel, registration services, and many more. She was the perfect interface to IEEE Computer Society staff and services. We also would like to thank Silvia Ceballos for her support and vision of IEEE Quantum Week. We especially thank the outstanding exhibits team that exceeded all our exhibits sales expectationsRegan Pickett, Amir Draquez, and Michelle Tubb. Marketing is critical for a growing conference – we are deeply indebted to Katherine Mansfield and Michelle Tubb for leading this activity. We especially thank Steve Woods for his outstanding technical support, his outstanding support for the RD Mobile platform, and the orchestration of the student mentorship session. We thank Lisa O'Conner and Patrick Kellenberger for their outstanding Conference Publications Services (CPS) for creating three volumes of the QCE23 proceedings. We are deeply indebted to Marie Trinh, Priscilla An, and Tricia Yamaguchi for their excellent Registration Services through Cvent. Finally, we would like to thank Anne Marie Kelly, Melissa Russel, and Nita Patel for bringing the prestigious IEEE Computer Society Awards to IEEE Quantum Week 2023.

September is a perfect time to experience true nature in the majestic beauty of the Pacific Northwest. Explore Mount Rainier National Park, the towering pinnacle of the Cascade Range, hike trails at Mount Baker, or visit Mount St. Helens to understand the impact of the monumental 1980 eruption. Discover the ancient waterways of Puget Sound, sculpted beautifully by glaciers that receded 14,000 years ago. The Olympic Peninsula National Park is an experience to spark your senses and immerse you in its raw beauty.

Whether you attend IEEE Quantum Week 2023 in-person or online, we hope that you will find the program and the events to be a terrific experience. We want you to enjoy the conference this week, meet new colleagues, and find plenty of time in the weeks to come to explore the many outstanding contributions from the international quantum community.

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