

Press Release

Exploring Open-Quantum Systems and Noise Characteristics

In Collaboration with the LRZ, HQS Quantum Simulations presents the HQS Noise App at a Workshop

Karlsruhe, 2024-03-21: The Leibniz Supercomputing Centre (LRZ) has recently installed the HQS Noise App from HQS Quantum Simulations, a significant milestone in their collaborative efforts to advance quantum computing technology. This installation is a key component of the Q-Exa project, where LRZ and HQS aim to explore the intricate details of quantum computing and accelerate the development of quantum computing applications for various companies and researchers. To meet the objectives of the Q-Exa project, the HQS Noise App underwent significant enhancements. These enhancements were carefully designed to align the app's capabilities with the project's goals. After rigorous development and testing, the final version of the app has been successfully delivered. LRZ and HQS are delighted to announce a joint workshop to showcase the latest iteration of the HQS Noise App.

Empowering HPC with Quantum Technologies

The Q-Exa project addresses challenges in quantum computing's NISQ era, focusing on the integration and acceleration of High-Performance Computing (HPC). Its goal is to overcome noise and errors in quantum computers by simulating quantum mechanical systems. The project delivers a state-of-the-art quantum computing demonstrator based on superconducting circuits, with a 20-qubit quantum computer provided by Q-Exa partner IQM Quantum Computers. Its mission is to grant early access to quantum accelerated HPC for both scientific research and industrial applications.

The HQS Noise App - Function and new features

Aligning with the objectives of the Q-Exa project the simulation software HQS Noise App, designed by HQS, has been improved. The app simulates open quantum mechanical systems, allowing the investigation of complex physical systems without constraints of faulty qubits, memory, and data processing. The HQS Noise App runs successfully on quantum computer systems as well as on conventional computer systems.

The latest version of HQS Noise App brings significant enhancements. Firstly, it now supports simulations of fermionic systems, allowing users to input fermionic structure Hamiltonians alongside the standard spin Hamiltonians, thus broadening the scope of simulations. Additionally, the introduction of flexible noise models offers users greater control over noise modeling. These models include continuous decoherence model and decoherence on gate, enabling users to incorporate various noise channels into their simulations, thereby enhancing the accuracy and realism of results.

Dr. Mario Hernandez-Vera, quantum application researcher at LRZ, shared his enthusiasm for the collaboration, stating, "The HQS Noise App represents a noteworthy achievement in the continual progress of quantum computing. With its support for Fermionic systems and flexible noise models, researchers can now explore new possibilities and push the boundaries of quantum simulations."

Invite to the Workshop

LRZ and HQS are collaborating to host a workshop to unveil the latest version of the HQS Noise App simulation software. Titled "Advancing Quantum Computing," the workshop is scheduled for April 10, 2024, at the Leibniz Supercomputing Centre in Garching near Munich. It will delve into topics such as open-quantum systems, noise-driven algorithms, and circuit design. Attendees can expect live demonstrations of the HQS Noise App and hands-on sessions with quantum software packages. Additionally, participants will be introduced to HQS's open-source software packages qoqo and structure, along with various backends for circuit simulation. The workshop is aimed at quantum computing enthusiasts and professionals with prior knowledge in Python coding and quantum mechanics. To secure a spot at this exclusive event, interested individuals are encouraged to register by March 27, 2024, using the following [link](#).

"We are excited to present the latest version of the HQS Noise App and collaborate with LRZ for this enriching workshop," said Dr. Konstantina Alexopoulou, Business Development Manager at HQS. "By addressing open-quantum systems and leveraging the noise characteristics of near-term quantum computers, we aim to equip participants with innovative tools to delve into the forefront of quantum computing and craft pioneering solutions."

About HQS Quantum Simulations

HQS Quantum Simulations represents a new era in quantum simulation. We harness the potential of quantum mechanics to develop innovative industrial applications. Our solutions are based on innovative approaches to accurate and efficient material prediction and analysis at the quantum level. HQS software is used in the pharmaceutical and chemical industries, as well as in the development and research of quantum computers, sensors, optical components, and laser applications.

Contact

Dr. Michael Marthaler
CEO & Co-Founder
E-Mail: press@quantumsimulations.de
www.quantumsimulations.de

HQS Quantum Simulations GmbH
Rintheimer Straße 23 A
76131 Karlsruhe