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Advancements in Quantum Computing in Egypt: A Journey with the Alexandria Quantum Computing Group

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Alexandria Quantum Computing Group (AleQCG) has been at the forefront of quantum computing research in Egypt since 2016. Situated in the Department of Mathematics and Computer Science at the Faculty of Science, Alexandria University, Egypt, AleQCG focuses on various aspects of quantum computing:

1. **Quantum Algorithms:** AleQCG designs novel quantum algorithms to address complex computational problems, leveraging the unique properties of quantum systems.
2. **Quantum Circuit Synthesis and Optimization:** The group conducts pioneering research in optimizing quantum and reversible circuits, ensuring efficient utilization of quantum resources.
3. **Quantum Machine Learning:** AleQCG explores the intersection of quantum computing and machine learning, aiming to unlock new capabilities through quantum-enhanced models.
4. **Quantum Cryptography:** Investigating secure communication protocols based on quantum principles, AleQCG contributes to the field of quantum-safe cryptography.
5. **Quantum Dot Cellular Automata:** The group explores alternative quantum computing paradigms, including quantum dot cellular automata, which holds promise for future quantum technologies.

AleQCG has made significant contributions to integrating quantum computing into the curricula of various institutions in Egypt at the BSc, MSc, and PhD levels. Many Master's and PhD students from Egypt and the Middle East have graduated under their guidance. Additionally, AleQCG has successfully completed several projects funded by the ASRT (Academy of Scientific Research and Technology).

The group has established the Center of Excellence for Quantum Computers at Alexandria University, serving both the community and researchers. AleQCG played a key role in establishing and coordinating the Professional Master's program in Quantum Computing and Quantum Informatics offered by Alexandria University.

Furthermore, AleQCG collaborates extensively with institutions across Egypt, the Middle East, Africa, and worldwide. They organize workshops and participate in global events to raise awareness about the importance of quantum computing. Notably, the group represents Egypt in initiatives such as QWorld and World Quantum Day.

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