International Year of Quantum Science and Technology (IYQ)-2025, at TCG CREST (Kolkata, India)

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INTERNATIONAL YEAR OF
Quantum Science
and Technology

Prof. Manas Mukherjee
A*STAR's Institute of Materials Research and Engineering (IMRE), Singapore.

Date & Time:
5th August, 2025 @ 3:00 PM IST

Venue:
Classroom-4, TCG CREST

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Title – Quantum Machine Learning in an Ion Trap Quantum Computer

Abstract

Ion trap-based quantum computers are at the forefront of the pursuit toward utility-scale quantum systems, owing to their superior gate fidelity and exceptional controllability. While today's quantum hardware remains noisy and has yet to demonstrate practical quantum advantage, it provides a compelling sandbox for exploring the capabilities of future quantum technologies.

In parallel, classical machine learning continues to revolutionize the understanding and processing of human languages and other complex patterns. Yet, as the dimensionality and intricacy of the problems increase, classical hardware struggles to meet escalating computational and energy demands.

In this work, we explore the synergy between quantum computing and machine learning, leveraging the expansive nature of the Hilbert space through a quantum-classical hybrid architecture based on ion trap systems. Specifically, we implement a quantum classifier, demonstrating the potential of quantum models to complement and enhance classical learning tasks.

Furthermore, our recent investigations reveal that such hybrid quantum systems are not immune to cybersecurity threats - we also demonstrate their vulnerability to external cyber-attacks, underscoring the need for robust quantum cybersecurity frameworks as we advance toward practical quantum applications.

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For more details, please visit the website: http://www.tcgcrest.org/iyq2025
For any queries, feel free to contact us through the email: iyq.2025@tcgcrest.org