Contribution ID: **428** Type: **Talk**

Identification of Quantum Hardware based on Noise Fingerprint Using Machine Learning

Monday, 1 December 2025 14:10 (20 minutes)

This project focuses on identifying quantum hardware based on its unique “quantum noise fingerprint” using machine learning. Each quantum computer exhibits a distinct noise signature due to physical imperfections, and recognizing these patterns can aid in hardware development, calibration, and security. We utilized basic machine learning algorithms (SVM, KNN) to analyse noise characteristics and predict which IBM quantum machine executed a given circuit.
Methodology and Observations
Data was gathered from IBM’s Qiskit platform, including actual hardware runs (facilitated by a CSIR educational license) and refreshed software simulations. An HPC cluster was essential for processing and simulating the extensive datasets due to the computational demands, allowing for efficient parallel data transformation. The SVM and KNN machine learning models were then trained on this data, after feature engineering and parameter tuning was completed. Initial findings showed high accuracy (over 96%) when models were trained and tested on data within the same category (e.g., training on hardware data and testing on hardware data). However, a significant drop in accuracy was observed when attempting to identify machines across different data types (e.g., training on software simulations and testing on actual hardware). Furthermore, we noted that IBM’s refreshed simulation noise models are not static and evolve over time

Presenting Author

Rameez Abdool

Email

2589793@students.wits.ac.za

Student or Postdoc?

Bachelors (4 year) or Hons

Institute

University of the Witwatersrand

Registered for the conference?

No

CHPC User

CHPC Research Programme

Primary authors: Mr ABDOOL, Rameez (Wits); Ms EPSTEIN, Jenna (Wits)

Presenters: Mr ABDOOL, Rameez (Wits); Ms EPSTEIN, Jenna (Wits)

Session Classification: Special

Track Classification: Quantum Computing