Deep Learning Indaba 2025 Workshop Proposal

Quantum Machine Learning for Africa (QML4Africa)

Abstract:

Quantum machine learning (QML) is an exciting new field of study which harnesses the laws of quantum mechanics and applies it to classical machine learning models. QML has a wide variety of potential applications spanning many fields which include healthcare and life sciences, climate and sustainability, finance and optimization. Two parallel activities have emerged to pioneer the field of quantum discoveries: one is the technological advancements required (hardware, software and algorithms) and the other is the rapid exploration of domain-specific problems towards identifying quantum advantage over classical methods. In this workshop, we will provide the participants with an introduction to QML from a theoretical perspective, as well as a practical implementation of the Qiskit programming SDK.

Goals and Objectives:

Bringing together the classical and quantum world, this workshop will dive into a hybrid world where classical statistical methods merge with the atomistic levels of quantum computation. While quantum computing may seem daunting at first to non-physicists, this workshop will provide a primer on the basic principles on which quantum computation is built, followed by practical exercises conducted using the Qiskit SDK. The goal for this first workshop on quantum machine learning at Deep Learning Indaba aims to Inspire, Enable, and Motivate our young, African researchers to add QML to their list of skills. By equipping participants with fundamental knowledge and code needed to embark on their quantum journey, we envision participants from diverse backgrounds benefitting from this hands-on exposure to QML. By focusing on “quantum machine learning”, we aim to provide participants with the necessary tools and knowledge for adapting the code to their own unique research problems and data.

Organizing team:

Primary contact: **Stephanie Müller, IBM Research Africa**

Dr Stephanie Müller is a Staff Research Scientist and Technical lead for the team working on Quantum Applications at IBM Research Africa. Based in the South Africa lab, Stephanie leads a diverse team of researchers in their quest to demonstrate quantum utility in the domain of healthcare and life sciences. With degrees spanning Human Genetics, Bioinformatics, and Biomedical sciences, Stephanie is able to bridge the gap between new technologies and domain applications of global interest. Stephanie was part of the 2024 ICLR Workshops Organizing Committee.

Ndivhuwo Nyase is a Research Scientist at IBM Research Africa, working on Quantum Applications for Healthcare and Life Sciences. Based in the South Africa lab, he advances hybrid quantum-classical machine learning models for cancer research and biomarker discovery. With a strong background in Data Science, Artificial Intelligence, and Topological Data Analysis, he also leads quantum advocacy efforts, organizing meetups, workshops, and collaborations to drive the growth of quantum computing in Africa.

Dr Lebohang Mashatola is a Research Scientist working on quantum machine learning applications at the IBM Research Africa (South Africa lab). With a background rooted in cancer biology and bioinformatics, Lebohang's research focus has evolved towards using quantum computing with the aim of incorporating his domain knowledge into quantum research at IBM, facilitating its practical application in the healthcare sector.

Dr Aviwe Kohlakala is a Postdoctoral Research Intern in the Quantum Applications team at IBM Research Africa (South Africa lab). Aviwe's background is rooted in a sturdy education in mathematics, with a focus in mathematical modelling and digital Science which involves areas such as digital image processing, computer vision, machine learning, and medical imaging.

Tentative Agenda / Schedule:

Goal: Introduce QML concepts, provide hands-on experience, showcase healthcare applications, and encourage African researchers to engage in QML.

Full-Day Workshop (9:00 AM – 4:00 PM)

Tentative Agenda:

Time slot	Item	Topic
9:00–9:55 AM	Invited Speaker 1 *possibly Prof Petruccione	QML Foundations & Africa's Potential
10:00–11:00 AM	Practical Session 1:	Introduction to Qiskit: Qiskit Installation and Basics
11:00 –11:30 AM	Lightning Talks 1 (3 * 8 min selected presentations from top poster submissions)	Student researchers present projects relating to QML or any domain where application is applicable.
11:30 – 12:00 PM	Tea Break	Posters and Networking

12:00 – 1:00 PM	Practical Session 2	Step-by-step coding tutorial (e.g., quantum circuits, simple algorithms).
1:00 – 2:30 PM	Lunch	Posters and Networking
2:30 – 3:30 PM	Practical Session 3	Advanced Qiskit
3:30 – 4:00 PM	Wrap up and next steps e.g. project brainstorming	

Sponsorship & Funding:

We are unable to commit sponsorship at this time.

Promotion & Advertising:

To encourage participation in this workshop and the CHPC conference in general, we will leverage our wide academic and industry-based social media networks on LinkedIn and our mailing lists spanning several interest groups and universities in our respective roles.

Previous delivery of the workshop and feedback:

1. Deep Learning Indaba X – Stellenbosch, South Africa (60+ partiipants)
2. Deep Learning Indaba – Kigali, Rwanda (~100 participants)

Diversity & Inclusion:

Our dedication to diversity, equality and inclusion is represented in our organizing team, spanning three institutions (IBM Research, eBrain lab at New York University Abu Dhabi, and the University of Kenya), as well in the diversity of our speakers from IBM Research, AIMS Ghana and AIMS South Africa.

- The organizing committee includes representation from different affiliations (academia and industry), seniority (graduate students and senior researchers), gender, and ethnicity.

- The speakers and panelists are chosen from different fields of expertise (both biology and ML), various institutions (both academia and industry), and different seniority levels, genders, and geographic locations.

Furthermore, this workshop will focus on **Quantum Machine Learning** as a tool that may be broadly applied across many domains and thus will be useful for a large cohort of attendees from various disciplines.

Additional Information:

For this workshop, all participants will need to have access to a laptop (their own, or shared) and create a free IBM Quantum account. More information for preparation will be shared in the build-up to DLI.