**Summary of Abstract**

Because of limitations of computational power in classical computers, many ML researchers have turned to QML, in the paper, there will be a **Review of literature in Quantum Machine Learning (QML), comparison of QML to classical counterparts and why Quantum resources will provide an advantage over classical ML.** How to upload classical data into Quantum form, is also taken up.

**Summary of Introduction**

Basic coverage of accomplishments made by ML and Reinforcement learning algorithms, challenges being faced due to restrictions of power of TPUs and GPUs. Quantum computing is based on quantum mechanics (Entanglement and interference), and can be used to efficiently solve selected problems.[[1]](#footnote-1) The paper aims to provide a bridge between the Quantum computing and Machine learning communities. General purpose quantum computation is expected to be reached within 15 years.

**Essential quantum computation** (Only for people unfamiliar with quantum computing beforehand)

Doing computations using **quantum mechanical systems**, such information is termed **quantum information,** Quantum computational models give a probabilistic version of reversible computation, where 1-1 correspondence occurs between input-output. Physical states are represented by density matrices, trace-one[[2]](#footnote-2) and positive-semi-definite[[3]](#footnote-3) matrices that generalize the concept of probability distributions. The logical states used by a quantum computational model are identified with the physical states of the quantum system that implements them. Computations are done by applying a sequence of unitary matrices to an initialized state. A probabilistic output is obtained by the distribution encoded in the final density matrix.

**Qubit: the primary state of any quantum system with two degrees of freedom, thus corresponding with 0 and 1s in a binary unit.**

Where, ,,

1. QML for this paper is restricted solely to describing learning models that make use of quantum resources. [↑](#footnote-ref-1)
2. Sum of Diagonal (main diagonal) is one [↑](#footnote-ref-2)
3. <https://en.wikipedia.org/wiki/Definiteness_of_a_matrix> [↑](#footnote-ref-3)