# Stock Price Prediction Using Quantum Computing and Federated Learning


## Abstract

Stock market prediction is a challenging task due to the volatility and non-linear dependencies of financial data. Traditional machine learning models, while effective, struggle to capture sudden market fluctuations caused by investor sentiment, economic indicators, and global events. In this project, we propose a **Quantum Computing and Federated Learning**-based stock price prediction system that leverages cutting-edge AI techniques to improve forecasting accuracy.

**Quantum Machine Learning (QML)**, specifically **Quantum Support Vector Machines (QSVMs) and Variational Quantum Circuits (VQCs)**, enhances the ability to detect complex patterns in high-dimensional stock market data. Unlike classical machine learning models, quantum algorithms can process multiple potential market states simultaneously, providing more robust and probabilistic predictions. The system is implemented using IBM's **Qiskit** framework, enabling cloud-based quantum computations.

Additionally, **Federated Learning (FL)** is incorporated to allow multiple financial institutions and stock brokers to collaboratively train the model without sharing proprietary data. This ensures compliance with privacy regulations such as **GDPR and SEC guidelines** while improving model generalization across diverse financial datasets. The system integrates **sentiment analysis using transformer-based NLP models** (BERT, FinBERT) to analyze real-time news articles and social media discussions about stocks.

By combining **Quantum AI with Federated Learning**, this project creates a **privacy-preserving, real-time, and scalable stock prediction system** that can be deployed on cloud-based trading platforms. Future work includes integrating **Reinforcement Learning-based trading bots** for automated decision-making and expanding the model to predict cryptocurrency trends.