**Shri Ramdeobaba College of Engineering & Management, Nagpur**

**Department of Computer Science & Engineering**

Session: 2025-2026

**Department: Computer Science and Engineering (Data Science)**

Semester: VII

**PROJECT SYNOPSIS**

**Member Details:**

|  |  |  |
| --- | --- | --- |
| **Section** | **Roll Number** | **Name of Students** |
| A | 03 | Ashwini Bisen |
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**Name of Guide:**

Dr. Supriya Bani Gupta

**Project Title:**

Quantum-Driven Sentiment-to-Forecast Pipeline for Financial Markets

**Project Definition:**

This project builds a quantum-enhanced engine that reads financial news and social media posts, understands the sentiment behind them, and predicts short-term stock price movements. It combines Quantum Natural Language Processing for extracting sentiment, a Quantum Transformer for forecasting trends, and a Quantum Neural Network to recommend actionable trade decisions. The system leverages frameworks like TensorFlow Quantum **(TFQ)** and **Cirq** to build hybrid quantum-classical machine learning models optimized for noisy intermediate-scale quantum (NISQ) devices, making it suitable for near-term quantum hardware while solving real-world financial problems.

**Project Objective:**

The primary objectives of the project are:

1. To apply QML to real-world financial forecasting challenges.

2. To extract sentiment from news using Quantum NLP techniques.

3. To forecast stock trends with Quantum Transformers and price data.

4. To generate Buy/Sell/Hold signals via Quantum Neural Networks

5. To benchmark hybrid models on NISQ devices against classical Machine Learning models.

**Proposed Plan of Work:**

**1. Data Collection & Preprocessing**

* Collect financial news, tweets, and stock price data
* Clean, tokenize, and prepare datasets for modeling

**2. Quantum Sentiment Analysis (QNLP)**

* Encode text into quantum circuits using Qiskit/PennyLane
* Train hybrid QNLP model to classify sentiment

**3. Quantum Time Series Forecasting (QCSAM)**

* Combine sentiment and price data as input features
* Apply Quantum Transformer to predict short-term trends

**4. Trading Signal Generation (QNN)**

* Build QNN model to classify Buy/Sell/Hold signals
* Train using predicted trends and sentiment scores

**5. Dashboard Development & Visualization**

* Develop dashboard to display sentiment, forecast and visualizing quantum attention

**Methodology:**

* **Dataset Preparation:**  
  Collect financial data from sources such as Twitter, Yahoo Finance, and news APIs. Preprocess the text data through cleaning and tokenization, and align it with corresponding historical stock price data.
* **Quantum Encoding:**  
  Encode sentiment and numerical features using quantum circuit techniques such as angle or amplitude encoding. Represent time-series inputs using parameterized quantum gates or hybrid classical-quantum encodings.
* **Circuit Design:**  
  Design QNLP circuits for sentence-level sentiment analysis. Construct Quantum Transformer layers with self-attention mechanisms for modeling time-series trends.
* **Model Construction:**  
  Build hybrid quantum-classical models by combining quantum circuits with classical neural layers. Configure the output for classification (Buy/Sell/Hold) or regression (price prediction) tasks.
* **Training and Evaluation:**  
  Train the models on simulated quantum backends using frameworks like Cirq, Qiskit, or TensorFlow Quantum (TFQ). Evaluate model performance using metrics and benchmark against classical machine learning models.
* **Deployment & Visualization:**  
  Develop an interactive dashboard to display real-time news feeds, sentiment scores, price forecasts, and trade recommendations. Integrate explainable visualizations to enhance model interpretability.

**Technology:**

The implementation of this project utilizes **Quantum Machine Learning frameworks** such as **TensorFlow Quantum**, **Cirq**, and **Qiskit** to design and simulate quantum circuits for sentiment analysis and time series forecasting. Libraries like **Python**, **NumPy**, **Pandas**, **NLTK**, and **Scikit-learn** are employed for data preprocessing, feature extraction, and integration with quantum components. The **frontend interface** is developed using **Streamlit**, for an interactive and user-friendly dashboard for visualization. Real-time financial data is collected through APIs like **Twitter** and **Yahoo Finance**, enabling live sentiment extraction and market forecasting. All components are integrated into a **hybrid quantum-classical pipeline** that bridges quantum computing with practical financial analytics.

**Functional Specifications [Deliverables]:**

1. **Data Module:**  
   Collects and preprocesses financial news, tweets, and stock price data.
2. **QNLP Engine:**  
   Analyzes sentiment using quantum circuits and outputs sentiment scores.
3. **Quantum Forecasting Module:**  
   Predicts short-term stock trends using quantum self-attention.
4. **Trade Signal Generator:**  
   Provides Buy/Sell/Hold decisions using a QNN-based classifier.
5. **Web Dashboard:**  
   Displays real-time sentiment, forecasts, and trading signals with visualizations.

**Project Scope:**

This project lays the foundation for integrating quantum computing into real-time financial decision-making. As quantum hardware advances beyond NISQ limitations, the models can be deployed on actual quantum processors for improved speed and accuracy. Future extensions may include multi-language sentiment analysis, deeper integration with live trading platforms, and the use of larger financial datasets for enhanced generalization. Additionally, the hybrid quantum-classical pipeline can be expanded to support portfolio optimization, risk analysis, and anomaly detection. With increasing financial market complexity, quantum-enhanced models hold the potential to outperform traditional approaches in both speed and insight. This project also opens doors for academic research, patent opportunities, and enterprise-level applications in fintech, algorithmic trading, and investment analytics.

**Approved by:**

**Dr. Supriya Bani Gupta**

(Name of Guide and Sign)