



# Algorithmic Trading Models for BTC/USDT Market

Outperforming Benchmark Returns through  
Data-Driven Strategies

# Team Details



Team Name: **Techiee Hackers**

## **Team Members**

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# Introduction

- The challenge is to **develop BTC/USDT trading algorithms** that surpass current benchmarks.
- In the volatile cryptocurrency markets, algorithmic trading is essential for its ability to provide swift, precise, and adaptive strategies.
- The primary goals include generating returns and managing risk effectively. and it is achieved by the implementation of sophisticated, adaptable models specifically designed for BTC/USDT trading.
- The forthcoming exploration involves the design, testing, and optimization of tailored algorithms, ensuring their **efficiency in navigating the complexities of cryptocurrency trading.**

# Data Acquisition

Data Source	yfinance - Python library
Time Frame	01-01-2018 to 31-01-2022
Data	BTC & USDT

**Importance of Quality Data:** In recognizing the pivotal role of precise data in algorithmic trading, the **yfinance library** ensures **reliability and accuracy**, facilitating in well-informed decision-making.



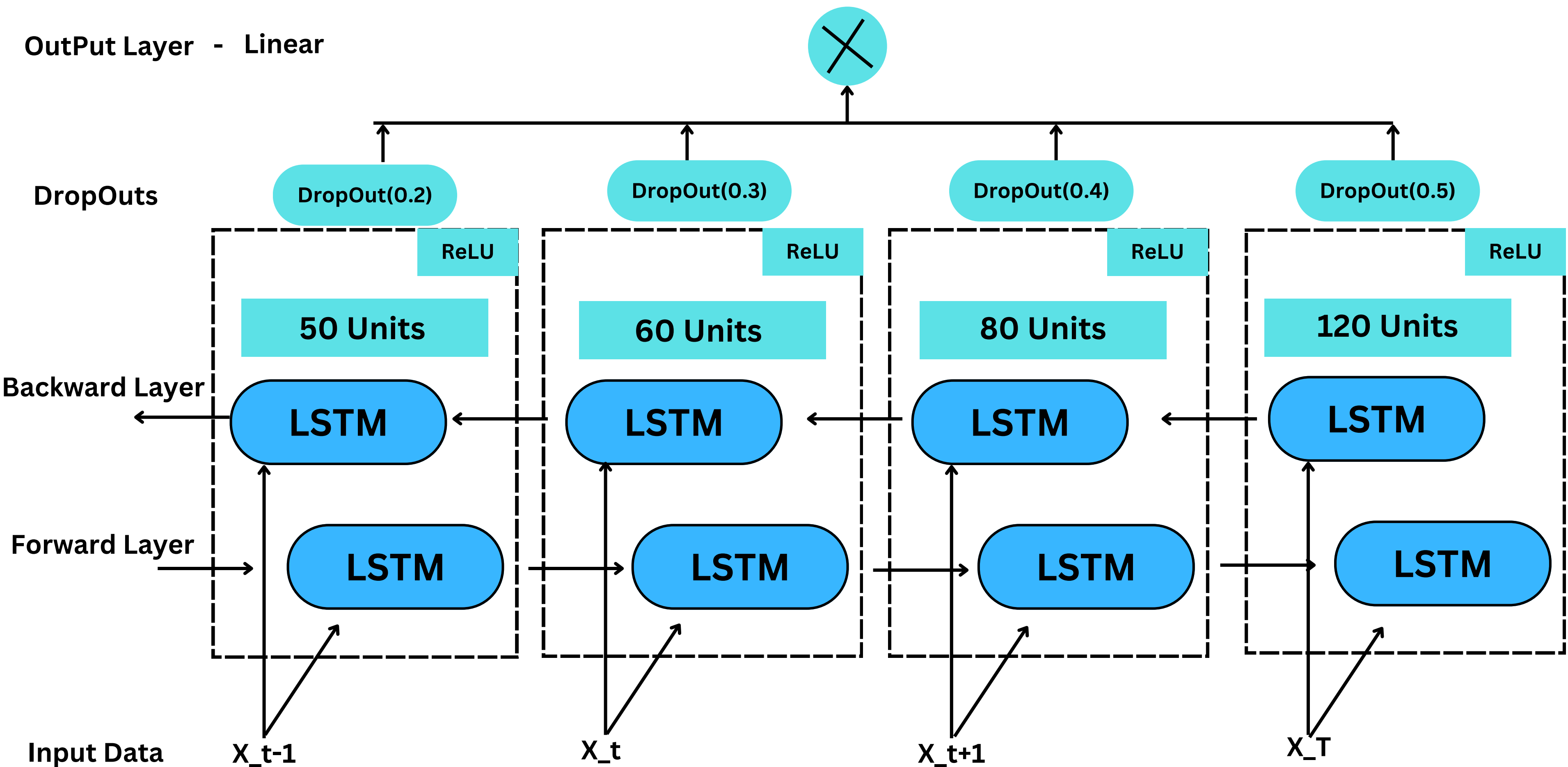
# Data PreProcessing

Feature Engineering	Description
Log-Transformed Closing Prices	Applied a logarithmic transformation to 'Close (BTC)' to stabilize variance.
RSI (Relative Strength Index)	Calculated RSI to assess overbought or oversold conditions.
MACD (Moving Average Convergence Divergence)	Computed MACD and Signal lines for trend identification.
Bollinger Bands	Determined upper and lower bands to identify potential reversal points.
Stochastic Oscillator	Incorporated the Stochastic Oscillator to measure momentum.
Volume Rate of Change	Calculated the percentage change in trading volume.
On-Balance Volume (OBV)	Calculated OBV to gauge buying and selling pressure.

Feature Engineering	Description
<b>Moving Averages</b>	Computed Simple Moving Averages (SMA) for 10 and 50 periods.
<b>Rate of Change (ROC)</b>	Calculated the rate of change to measure the momentum of price movements.
<b>Volume-Weighted Average Price (VWAP)</b>	Determined the VWAP to assess the average price based on both volume and price.
<b>Exponential Moving Average (EMA)</b>	Computed EMA to give more weight to recent prices, emphasizing short-term trends.

# Model Design

OutPut Layer - Linear



# Model Explanation

- **Input Layer:**

- Bidirectional LSTM (50 units, ReLU activation, return\_sequences=True) - Processes sequential input data.
- Dropout (0.2) - Reduces overfitting by randomly dropping 20% of neurons.

- **Hidden Layers:**

- Bidirectional LSTM (60 units, ReLU activation, return\_sequences=True) with Dropout (0.3).
- Bidirectional LSTM (80 units, ReLU activation, return\_sequences=True) with Dropout (0.4).
- Bidirectional LSTM (120 units, ReLU activation, return\_sequences=True) with Dropout (0.5).

- **Output Layer:**

- Dense layer with 1 unit - Generates the model output.

## Compilation:

- **Optimizer:**

- Adam optimizer - Efficiently updates network weights to minimize loss.

- **Loss Function:**

- Mean Squared Error - Measures the average squared difference between predicted and true values.

## Training:

- **Epochs:**

- Trained for 50 epochs - Number of times the entire dataset is passed forward and backward through the neural network.

- **Batch Size:**

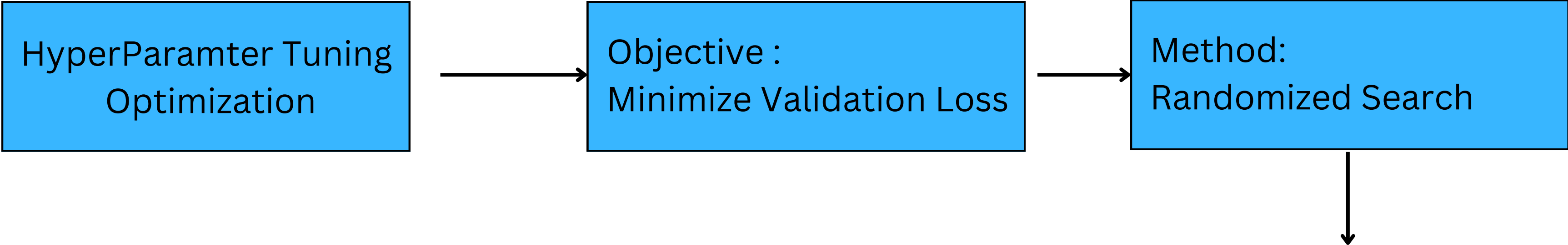
- Batch size of 32 - Number of training samples utilized in one iteration.

- **Validation:**

- Validation data from X\_test and y\_test used to evaluate the model's performance during training.



# Optimization



Best-HyperParamters Obtained

units_1	160
units_2	256
units_3	256
units_4	192
learning_rate	0.0001

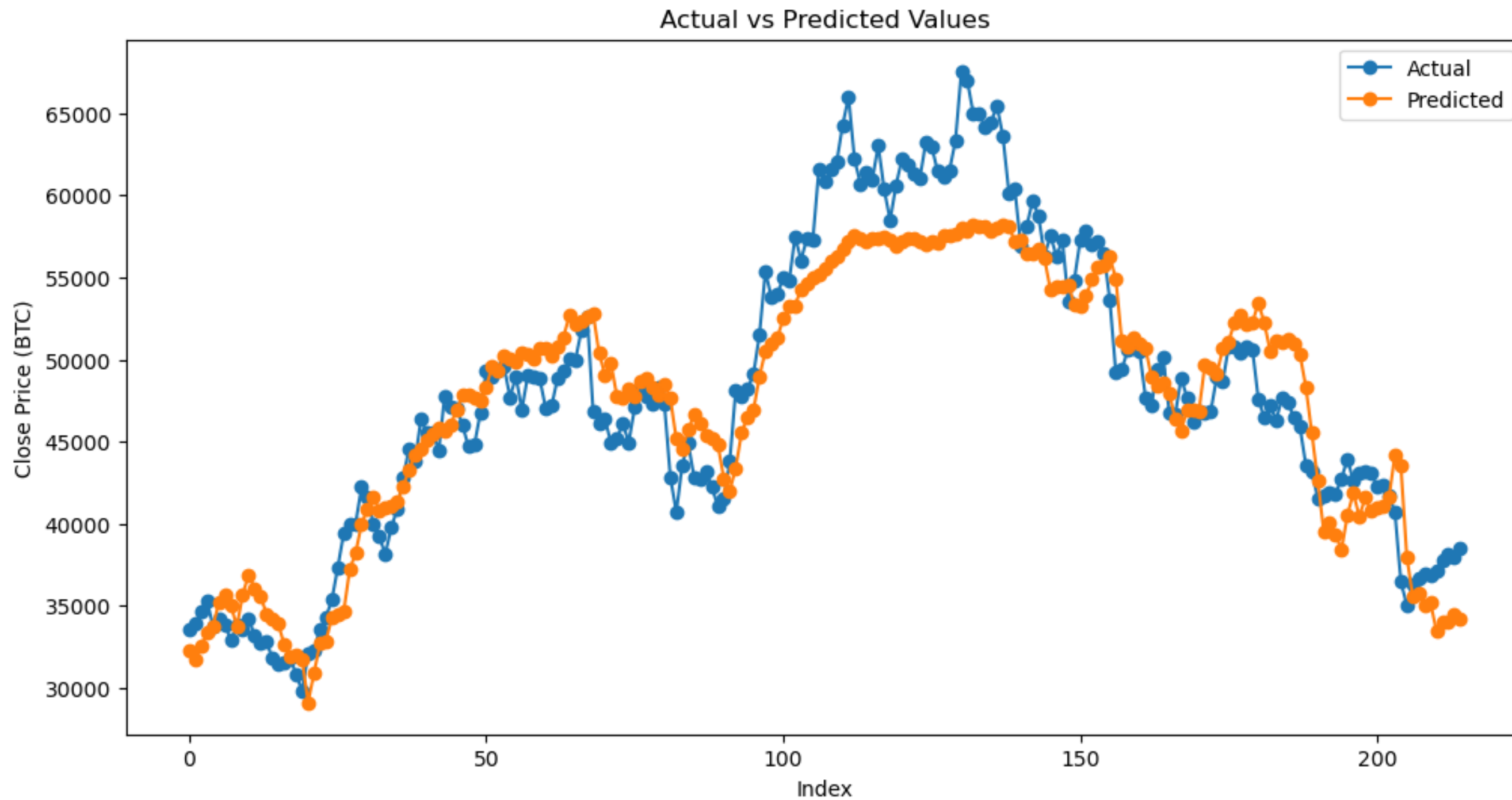
Number of Trials: 10

Hyper Paramters Explored

units_1	[32, 64, 96, 128, 160, 192, 224, 256]
units_2	[32, 64, 96, 128, 160, 192, 224, 256]
units_3	[32, 64, 96, 128, 160, 192, 224, 256]
units_4	[32, 64, 96, 128, 160, 192, 224, 256]
learning_rate	[0.01, 0.001, 0.0001]

# Model Evaluation - Before Optimization

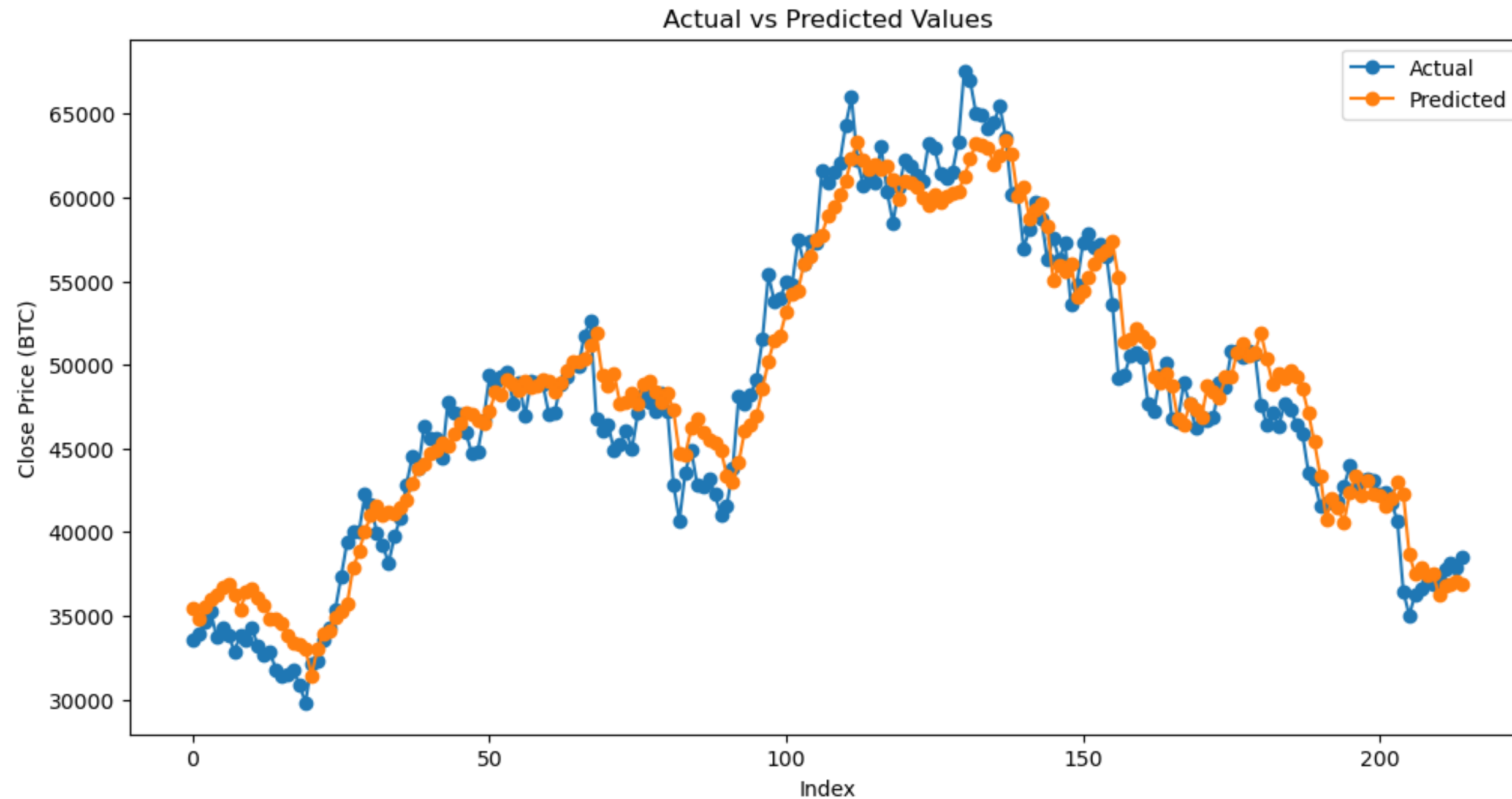
## For Test Data



**R2-Score : 0.8748**

# Model Evaluation - After Optimization

## For Test Data



**R2-Score :0.9441**

# Backtesting Strategy

- 1.Total Trades:** The total number of executed trades during the backtesting period.
- 2. Winning Trades:** The number of trades that resulted in a profit.
- 3. Losing Trades:** The number of trades that resulted in a loss.
- 4. Win Rate:** The percentage of winning trades relative to the total trades.
- 5. Returns:** The percentage change in the account balance over the backtesting period.
- 6. Sharpe Ratio:** A measure of the strategy's risk-adjusted returns, considering the volatility of the returns.
- 7. Maximum Drawdown:** The largest percentage loss from the peak to the trough in the account balance.

# Risk Management Strategy

## Components:

**Transaction Costs:** Consideration of fees and costs associated with executing trades.

**Position Sizing:** Determining the appropriate size of each position relative to the overall portfolio.

**Leverage Management:** Monitoring and controlling the use of leverage to avoid excessive risk.

**Stop-Loss Orders:** Setting predetermined levels at which a position will be automatically closed to limit losses.

## Risk-Reward Ratio:

**Definition:** The ratio of potential profit to potential loss on a trade.

**Objective:** Aim for a favorable risk-reward ratio to ensure that potential gains outweigh potential losses.



# Backtesting Results

Metrics	Results
Total Trades	12
Win Rate	50.00 %
Returns	11.11 %
Sharpe Ratio	22.5163
Maximum Drawdown	-0.09%

## Analysis and Insights:

### Win Rate and Returns:

50.00% win rate with an 11.11% return indicates a strategy capitalizing on profits while acknowledging losses.

### Sharpe Ratio:

High Sharpe Ratio (22.5163) reflects superior risk-adjusted return, efficient in managing risk compared to a risk-free investment.

### Maximum Drawdown:

Minimal -0.09% drawdown highlights effective risk management, limiting potential losses.

# Backtesting visualization

Trade history visualization showcases buy (green) and sell (red) signals against BTC/USD close prices.

