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Title:comparing and Evaluating machine learning models on three level moving average strategy returns

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# **Introduction**

Utilising Machine Learning models, in trading strategies benefitted many day and passive traders using advanced learning algorithms and data analysis to make profitable investments decisions. Machine learning, empowers traders to analyse large amounts of historical stock market data, enabling them to classify the best possible times for buying and selling stocks as well as predicting future stock prices.

This paper focuses on the implementation of the Three Level Moving Average Strategy. The strategy involves using multiple Exponential Moving Averages (Short (SMA) usually the window is 5-20 days, Intermediate/Middle (MMA) usually the window is 50-200 days and Long (LMA) usually the window is 200-250 days) to calculate the trend following the indicator that reacts to price change. The conditions for buy and selling stock is based on:

* Buy: When SMA crosses above MMA and LMA indicating a positive uptrend.
* Sell: When SMA crosses below MMA and LMA indicating a potential downward.

The machine learning model involves the comparison of three supervised learning algorithms:

* Logistic Regression
* SVM
* Decision Tree’s

The goal is to determine the most efficient algorithm for classifying the buy and sell points. This would help traders reduce tendency of psychological behaviour affecting their strategy while making decisions.

# **Literature Review**

Classifying the best possible buying and selling points in a trading strategy is critical of importance to traders and researchers. The capability of the machine learning model to classify the signals highly can contribute to significant gains. The objective of this implementation is evaluating the model based on the profit it returns with respect to the Three Level Moving Average Strategy.

The dataset is used is historical Apple stock data taken from yahoo finance. Metrics such as opening and closing prices, highs and lows and trading volumes are essential for the classification of signals (Buy and Sell). The implemented machine learning algorithms are Logistic Regression, Support Vector Machines (SVM) and Decision Tree’s, the models to adapt to the dynamic environment of the stock market conditions classify the optimal buy and sell signals. Logistic Regression is efficient when there is a linear relationship between features and labels. This needs less computational power. SVM is very reliable for analysing the complex relationships between data, especially when the decision boundary between buy and sell is very complicated. Decision Trees are very effective for analysing non-linear relationships in the dataset.

Despite the model’s capabilities to classify the buy and sell signals, there are several various factors (geopolitical events, macroeconomic shifts) that influence the dynamic conditions of the stock market environment. Overfitting was a very regular issue that was encountered while trying compute the best possible parameters for improving the model accuracy, while performing regularization for the algorithms since the models trained with past data and they would perform poorly on new data, which is a significant concern. However, with the ongoing developments in Deep Learning models such as Long Short-Term Memory (LSTM) Networks and Convolutional Neural Networks (CNN), are more reliable as they detect patterns in stock price charts and process sequential data efficiently. However, the scope of the model only evaluates supervised learning techniques mentioned above.

In the world of stock markets determining the best strategy is the primary goal of every trader. The use of ML models provides an approach to improvise buy and sell decisions by using previous stock data. However, challenges arise due to the dynamic environment of the market which increases the complexity of attaining consistent profitability. Advanced deep learning algorithms such as LSTM and CNN provide better results with its ability to analyse stock chart patterns improving the overall model accuracy. The combination of data science and conventional trading insights may open the door to more complex and dependable trading strategies that strike a balance between computational efficiency and predictive accuracy. Machine learning and deep learning are becoming more and more important in the never-ending quest to optimize stock trading techniques.

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# **Methodology**