Detecting Anomalies in Crypto Trading using Machine Learning

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Introduction

Bitcoin, the leading cryptocurrency, is increasingly accepted by major merchants.
On Nov. 6, 2017, Bitcoin's price was $7113.71 USD/BTC, with a market cap of $118,568,024,632 USD.
Investors favor Bitcoin for hedging, diversification, and cost-effective international transactions.
Bitcoin prices are highly volatile and sensitive to regulatory and market events, creating opportunities for informed trading.
Lack of supervision and 24/7 trading foster informed trading in the Bitcoin market.
Existing methods for detecting informed trading in stock markets are not suitable for Bitcoin.
This study proposes a novel indicator based on trade size imbalances to detect informed trades in the Bitcoin market.
Evidence of informed trading is found prior to significant events in the Bitcoin market.
Informed traders tend to build positions days before large events.
Estimated profits for informed traders range from $100,922 to $915,455 USD per event.

Research Aim

Objective: Develop accurate ML system for insider trading detection in crypto market.
Methods: Use advanced anomaly detection methods, optimize parameters, conduct feature engineering.
Labeling: Create precise labeling system with expert input.
Evaluation: Measure performance with precision, recall, and F1 score.
Real-time Monitoring: Implement adaptable strategies considering ethics.
Comparison: Assess against current models for effectiveness.

Research Questions

What role do machine learning models play in detecting anomalies in crypto trading?
Can machine learning models predict insider trading and price fluctuations?
What are the associated challenges in using machine learning models to detect anomalies in crypto trading?

Literature Review

Fang et al. (2022) note ML models' capability in detecting anomalies in crypto trading by analyzing price fluctuations, order volumes, and network activities, minimizing trade disruptions and enhancing transparency.
Sattarov et al. (2020) emphasize ML models' ability to analyze historical trade data and social media chatter to identify unusual behavior, including potential insider trading, and predict future price movements and market sentiment, improving trading outcomes.
Ren et al. (2022) highlight challenges such as false identification of normal trades as anomalies, lower effectiveness of ML models in real-time, and computational efficiency issues, underscoring the need for further research to address these gaps.

Methodology

1. Data Collection & Preprocessing:
 Gather crypto data (prices, volumes, news sentiment), clean, and engineer features. Evaluate model using metrics like RMSE, MAE.

2. Sector Exploration:
 Review literature on ML impact on crypto trade, gather industry insights, study case successes, and quantify ML strategy impact.

3. Model Stress Testing:
 Test models under real-world market conditions to find vulnerabilities.

4. Model Rework:
 Develop dynamic models for volatile markets, train models continuously for accuracy improvement.

5. Model Monitoring & Improvement:
 Constantly evaluate model performance against current market data for refinement.

Architecture
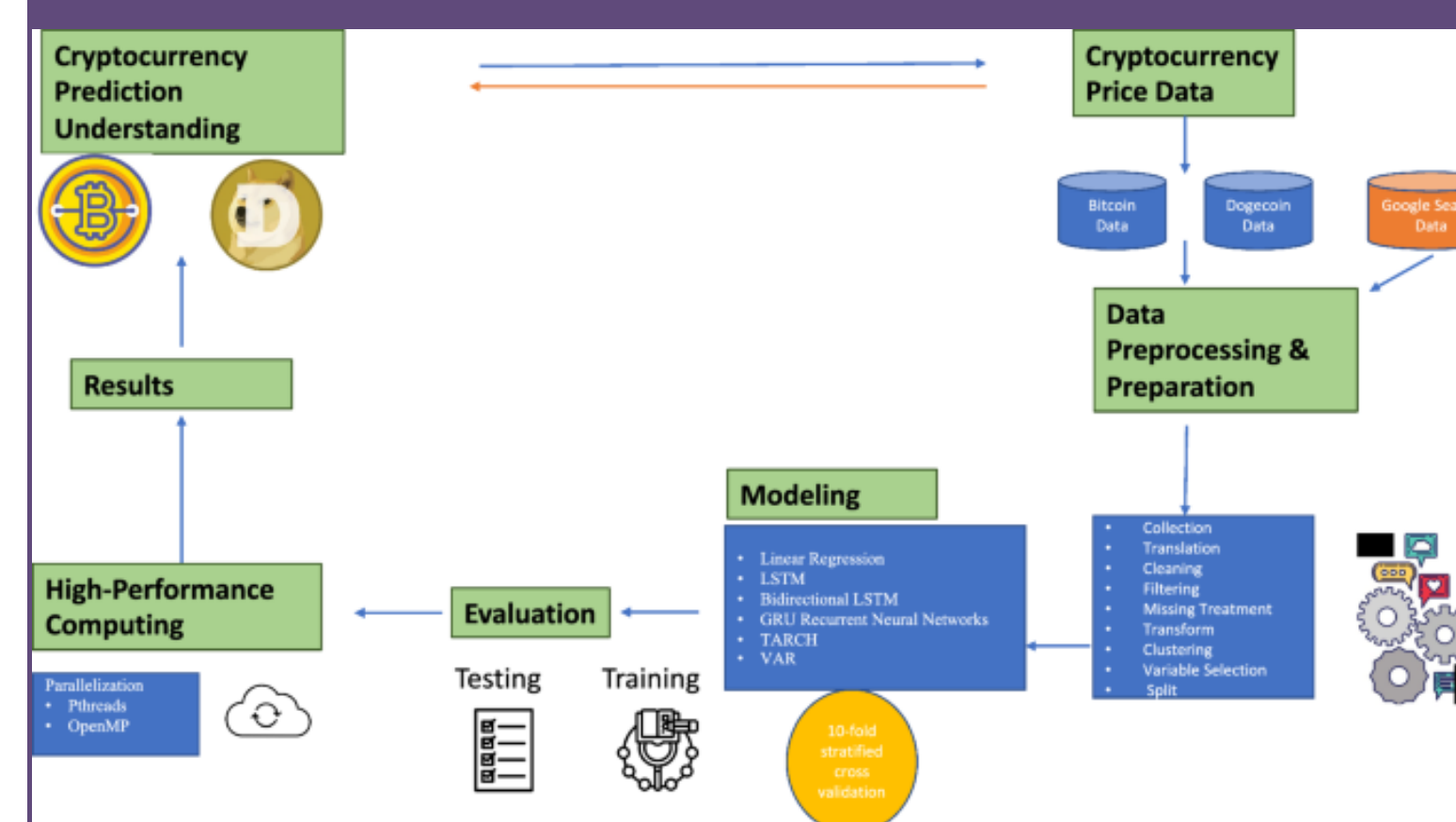
Conclusion

The research aims to enhance anomaly detection in cryptocurrency trading using machine learning techniques. Emphasizing precision and risk reduction, our algorithms analyze trading data to detect irregularities and trends. We focus on creating robust models that adapt to market volatility, providing traders and investors with dependable insights.

Technologies

References

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