Forecasting Cryptocurrency Market Trends Using Machine Learning on Multi-Dimensional Time Series Data

Michal Koren[1], Steven Berger[2], Raz Levy[3]

[1] *Shenkar—Engineering. Design. Ar, Israel*
[2,3] *Bar Ilan University, Israel*

ABSTRACT

The cryptocurrency market is characterized by extreme volatility and behavioral biases, often leading to suboptimal decision-making by both retail and institutional investors. This study proposes a data-driven forecasting framework that minimizes emotional influence by leveraging computational intelligence. Specifically, we develop a hybrid predictive model combining traditional machine learning with deep learning architectures to forecast short-term price movements in the cryptocurrency market. The model is trained on an extensive dataset comprising hourly Bitcoin price data from 2015 to the present. To enhance predictive performance, we engineer features across four key domains: Rate of Change (ROC), Candlestick Psychology, Volatility Awareness, and Volume Dynamics. These multi-dimensional inputs capture diverse aspects of market behavior and are used to inform the learning algorithms. The current implementation focuses on hourly price prediction for Bitcoin, with plans to generalize the approach across multiple timeframes and other cryptocurrencies. Experimental results indicate that the integrated model achieves competitive accuracy in predicting price direction, demonstrating its potential utility as a decision-support tool for market participants. By integrating statistical learning with the temporal sensitivity of deep neural networks, this framework offers a systematic and consistent alternative to human-driven trading decisions. The model's emotion-agnostic nature positions it as a valuable supplementary indicator for identifying optimal entry and exit points in a highly unpredictable trading environment.

Keywords: Forecasting; Trends; Machine Learning; Crypto; Bitcoin.