High-Frequency Cryptocurrency Portfolio Management Using Multi-Agent System Based on Federated Reinforcement Learning

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Abstract : Over the past decade, with the fast development of blockchain technology since the birth of Bitcoin, there has been a massive increase in the usage of Cryptocurrencies. Cryptocurrencies are not seen as an investment opportunity due to the market's erratic behavior and high price volatility. With the recent success of deep reinforcement learning (DRL), portfolio management can be modeled and automated. In this paper, we propose a novel DRL-based multi-agent system to automatically make proper trading decisions on multiple cryptocurrencies and gain profits in the highly volatile cryptocurrency market. We also extend this multi-agent system with horizontal federated transfer learning for better adapting to the inclusion of new cryptocurrencies in our portfolio; therefore, we can, through the concept of diversification, maximize our profits and minimize the trading risks. Experimental results through multiple simulation scenarios reveal that this proposed algorithmic trading system can offer three promising key advantages over other systems, including maximized profits, minimized risks, and adaptability.

Keywords : cryptocurrency portfolio management, algorithmic trading, federated learning, multi-agent reinforcement learning
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