

SimuMine: A Web-Based Bitcoin Mining Efficiency Simulator

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Abstract

Bitcoin mining is highly energy-intensive, and improving its efficiency is critical for both economic and environmental sustainability. This project presents a web-based simulation tool that models key aspects of Bitcoin mining, including the SHA-256 hashing algorithm, nonce iteration, and target difficulty checks. The computational backend is integrated with real-time power and thermal models, enabling the simulator to reflect how hash rate influences energy consumption and temperature. Interactive controls for frequency, voltage, and resistance, along with graphical visualizations of power usage over time, allow users to explore trade-offs between energy efficiency and mining performance. The simulation also includes a financial trade-off analysis feature and supports extended runtime testing to evaluate long-term behavior under varying operational conditions.

Index Terms

bitcoin mining, SHA-256, energy efficiency, ASIC simulation