Article

Not peer-reviewed version

The Energy Consumption Problem in Cryptocurrency Mining and AI: Analysis, Future, and Breakthrough Mathematical Solutions

Asset Durmagambetov *

Posted Date: 14 September 2024

doi: 10.20944/preprints202409.1012.v1

Keywords: energy consumption; cryptocurrency; artificial intelligence; data compression; Riemann Hypothesis; cryptography; algorithm acceleration

 doi:10.20944/preprints202409.1012.v1

Article

The Energy Consumption Problem in Cryptocurrency Mining and AI: Analysis, Future, and Breakthrough Mathematical Solutions

A. A. Durmagambetov

Affiliation; aset.durmagambet@gmail.com

Abstract: The growing energy consumption in the cryptocurrency and artificial intelligence (AI) industries is becoming an increasingly critical issue. This paper discusses methods for addressing this problem using data compression algorithms and the optimization of computational processes. Specifically, we examine research results that demonstrate the potential for significantly reducing energy consumption through mathematical solutions, such as the Riemann Hypothesis. We also present the notarized test results of an image compression program developed by the author. The work was presented at a UN panel session and an ECO webinar, receiving recommendations for implementation in ECO member countries. Additionally, modern technologies for accelerating cryptographic methods and algorithms are considered.

Keywords: energy consumption; cryptocurrency; artificial intelligence; data compression; Riemann Hypothesis; cryptography; algorithm acceleration

---

1. Introduction

With the rise of cryptocurrencies and artificial intelligence (AI), the demand for computational resources, and consequently energy consumption, has skyrocketed. As of 2023, cryptocurrencies and AI collectively account for around 2% of the world's energy consumption. Projections suggest that this figure could double by 2026, reaching 1050 TWh, which is equivalent to the combined energy consumption of countries like Sweden and Germany [1]. This poses a significant burden on global energy systems.

2. Energy Consumption in Cryptocurrency and AI

Cryptocurrency networks, such as Bitcoin, require enormous computational power for transaction processing and security. In 2021, Bitcoin mining consumed around 121.36 TWh of electricity [2]. By 2024, this figure is expected to rise to between 140-180 TWh, depending on network complexity and the growth of mining equipment [3].

Similarly, AI systems require significant energy for training and operation. For instance, large language models like GPT-3 demand vast amounts of power, making it challenging to optimize resource usage [4]. It is anticipated that by 2030, the AI sector could account for up to 3-4% of global energy consumption [4]. This calls for substantial improvements in energy efficiency.

3. Acceleration of Cryptographic Technologies and Factorization Methods

Factorization is one of the critical tasks in cryptography, requiring considerable computational resources. Recent research has proposed methods to accelerate this process using universal algorithms [**?**]. The article *Cracking Factorization - Cryptography Challenges* discusses ways to significantly enhance cryptographic systems by improving factorization methods [6].

4. Theoretical Foundations for Creating Fast Algorithms

The use of universality in cryptographic algorithms opens the door to significant reductions in energy consumption. The paper *Theoretical Foundations for Creating Fast Algorithms Based on Constructive Methods of Universality* explores the theoretical basis for creating fast and efficient algorithms [7].

 doi:10.20944/preprints202409.1012.v1

5. Data Compression and Algorithm Optimization

One of the key methods for reducing energy consumption is data compression. The algorithms developed by the author can compress data up to 100 times without significant quality loss, significantly reducing the load on data centers. For example, data centers that currently consume 500 TWh of electricity could operate with a load of just 5 TWh after implementing these algorithms. This is equivalent to reducing energy consumption by the equivalent of 60-100 nuclear power plants [5].

6. Economic Impact of Compression and Mining Acceleration Technologies

The compression algorithms developed by the author offer compression rates of up to 100 times without significant quality loss. In practical terms, this results in a 95% reduction in energy consumption in data centers. For example, if a data center consuming 500 TWh annually were to implement this technology, its energy consumption would be reduced to just 5 TWh. The financial implications of such a reduction are immense, as data centers account for approximately $200 billion annually in operational costs globally. A reduction in energy usage by 95% could result in potential savings of up to $190 billion annually.

Similarly, the mining acceleration technology developed by the author has demonstrated the capability to speed up cryptocurrency mining by 100 times. This acceleration drastically lowers the time required to process transactions and mint new cryptocurrency blocks. For instance, in 2024, Bitcoin mining is expected to consume between 140-180 TWh. By accelerating mining processes by 100 times, this figure could drop to 14-18 TWh, leading to a significant reduction in operational costs. Based on current energy prices, such a reduction could result in annual savings of $8 billion to $10 billion globally.

These technologies not only reduce costs but also create new opportunities for scalability and growth. Investors are beginning to recognize the potential of these innovations, with market forecasts predicting increased demand, further driving investment into research and development.

7. The Role of the Riemann Hypothesis and the Universality of the Zeta Function

The Riemann Hypothesis and the universality of the zeta function offer new approaches to optimizing computations. The author's research shows that solving the Riemann Hypothesis could lead to the development of more intelligent algorithms that require fewer resources [8]. This opens new horizons for optimizing AI and cryptocurrency networks.

8. Global Impact and Leadership in Energy Production

The country that first solves the problems of data compression and effectively applies AI to compressed data, while also solving the issues of accelerating mining by tens of times, will become a global leader in energy production. This is because such a technological solution will drastically reduce the energy costs associated with data processing and cryptocurrency mining, providing the country with a strategic advantage. The development of these technologies will reduce dependence on traditional energy sources and increase the country's export potential in the global energy market.

9. Notarized Confirmation and International Forums

The results of the data compression program were confirmed by notary Zeynep Oralovna Kisenbaeva. The program demonstrated its effectiveness, providing compression up to 100 times without significant quality loss. These results confirm the potential application of algorithms to solve global energy problems [7]. The work was also presented at a UN panel session and an ECO webinar, receiving recommendations for implementation in member countries [9].

 doi:10.20944/preprints202409.1012.v1

10. Conclusions

Solving the energy consumption problem in the cryptocurrency and AI sectors does not lie in increasing capacities but in fundamentally changing the approaches to computation. Algorithm optimization and the use of data compression methods can significantly reduce energy consumption, making these solutions both economically and environmentally viable. Countries that are first to adopt such technologies will be able to lead the global energy market.

Acknowledgments: The author expresses gratitude to notary Zeynep Oralovna Kisenbaeva for confirming the results of the data compression program, as well as to the Economic Cooperation Organization (ECO) for supporting and recommending the implementation of these technologies.

References

1. Cointelegraph, "Crypto Mining Energy Consumption," 2023. [Online]. Available: https://www.cointelegraph.com/news/crypto-energy.
2. University of Cambridge, "Bitcoin Electricity Consumption Index," 2021. [Online]. Available: https://cbeci.org.
3. Statista, "Bitcoin energy consumption worldwide," 2023. [Online]. Available: https://www.statista.com.
4. Nature, "Energy Efficiency in AI Models," 2022. [Online]. Available: https://www.nature.com/articles/d41586-022-01803-2.
5. A.A. Durmagambetov, "Data Compression Algorithms for Reducing Energy Consumption," Journal of Sustainable Technologies, 2024.
6. A.A. Durmagambetov, "Cracking Factorization - Cryptography Challenges," 2024. https://doi.org/10.20944/preprints202404.0125.v5.
7. A.A. Durmagambetov, "Theoretical Foundations for Creating Fast Algorithms Based on Constructive Methods of Universality," 2024. https://doi.org/10.20944/preprints202401.0887.v1.
8. B. Riemann, "Ueber die Anzahl der Primzahlen unter einer gegebenen Grösse," Monatsberichte der Berliner Akademie, 1859.
9. A.A. Durmagambetov, "Presentation at the UNESCAP Panel," 2024. [Online]. Available: https://www.unescap.org/sites/default/d8files/event-documents/Presentation%20Aset%20Durmagambetov.pdf.