Computing Power in the AI Era: Evaluating the Profitability of GPU Rental vs. Traditional Mining – Romania study case

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Abstract

The latest Bitcoin halving in 2024 increased the difficulty of crypto-mining. In parallel, the transition of the Ethereum network from a Proof-of-Work consensus mechanism to a Proof-of-Stake consensus mechanism has reconfigured the mining landscape, particularly affecting graphics processing unit (GPU)-based operations. Simultaneously, the rise of Artificial Intelligence (AI) has generated an exponential demand for computing power, opening up a new niche: renting the processing power of GPU systems to platforms dedicated to training AI models. This paper investigates the feasibility and economic efficiency of residential users leveraging the idle computing power of their high-performance systems to generate passive income. The research is structured around three main axes: a comparative analysis of cryptocurrency mining and computing power leasing; an assessment of the platforms that intermediates these activities; and an analysis of the efficiency of each method in the specific context of energy price fluctuations in Romania. The results of the study provide a practical decision-making framework for individual users and highlight a new model of the distributed economy at the intersection of blockchain and AI technologies.

Keywords

GPU; Artificial Intelligence; Cryptocurrency Mining; DePIN; Profitability; Computational Value.

Introduction

The distributed computing power is seeing an important shift in the valuation of high-performance hardware. Outside their targeted gaming and content creation sectors, consumer-grade GPUs were primarily driven by the economic benefits of Proof-of-Work (PoW) consensus mechanisms for securing decentralized ledgers for more than 10 years (Schinckus, 2021; Shifferaw & Lemma, 2021). This procedure, commonly known as cryptocurrency mining, established a clear link between a GPU's hashing capacity and its potential for profit. Recent structural changes in the technology and cryptocurrency industries have generated a reassessment of this paradigm. A GPU's usefulness is quickly changing from a tool for solving cryptographic puzzles to a new, highly sought-after frontier as the key resource for the artificial intelligence (AI) industry. This transition from a model focused on ensuring a fixed-reward system to one focused on providing a utility service to a market with rising demand signals a change in computational value.

Literature review

Two separate developments have drastically altered the economic environment, ending the conventional model of GPU-based income generation. These shocks made traditional mining less efficient for the typical home user, generating a market gap and a stock of unused gear.

"The Merge" was the first and most significant shock in September 2022 when the Ethereum network changed from a Proof-of-Work (PoW) to a Proof-of-Stake (PoS) consensus mechanism (Kapengut & Mizrach, 2023; EU-Blockchain, 2023). With an estimated 95% of all profits made from GPU mining, Ethereum was the undeniable foundation of the GPU mining ecosystem before this (CoinShares, 2025). Overnight, the Merge made this entire worldwide network of specialized hardware unusable for its main function. It is estimated that 1.2 Peta hashes per second (PH/s) of processing power previously used on the Ethereum blockchain was displaced by this event, resulting in a significant supply-side disruption (CoinShares, 2025).

This unused hash rate searched for the next most promising PoW alternatives. The network hash rates of Ethereum Classic (ETC), Ravencoin (RVN), and Ergo (ERG) increased by 808%, 511%, and 589%, respectively, in the weeks following The Merge (Coinshares, 2025). The sudden move to these alternative networks generated a substantial increase in mining difficulty, significantly lowering the payouts per unit of hash power. As a result, businesses that might have been profitable before became economically unfeasible for the individual home miner. By generating a massive supply of powerful hardware with no commercially viable use in the conventional crypto-mining environment, the merger changed the mining landscape and ended the period of consistent, high-volume profitability for GPU mining. Due to the overabundance of a valuable resource, such as GPU compute, that has no source of demand, the conditions for a new market were created.

The whole mining sector experienced an important margin reduction because of the second shock, which was the fourth Bitcoin halving in April 2024. The block reward was halved, reducing the gains from 6.25 BTC to 3.125 BTC per block in 2024 (Blockpit, 2024). Profitability margins were crushed by this 50% cut to miners' major source of income. Miners with less efficient gear or higher operating expenses (primarily energy) were the most affected (Coinbase 2024).

The economic implications of halving present capital importance for the entire PoW ecosystem, even though Bitcoin mining has always been the scope of specialized Application-Specific Integrated Circuit (ASIC) gear rather than GPUs. Large, well-capitalized institutional miners with access to economies of scale and inexpensive energy sources can absorb the income shock and purchase the assets of smaller, troubled operators, which has hastened the trend of industry consolidation. Due to this dynamic, the independent and residential miner has become more marginalized, making competition more challenging. Electricity costs as a percentage of block rewards for the Bitcoin network increased from an average of 40% in April 2024 to 67% in May 2024 after the halving, proving the severe impact on operating expenses. The main law for any GPU-based PoW coin is that, as block rewards are reduced by their own halving schedules, profitability becomes increasingly sensitive to energy costs, favoring professionally run large-scale operations over home setups (Gonzales et al., 2024).

The emergence of artificial intelligence has driven exponential, continuous increases in demand for processing capacity, which may offset the declining opportunities in bitcoin mining. The current data center infrastructure is under strain due to the highly demanding processes involved in the creation, training, and deployment of complex AI models, especially generative AI and Large Language Models (LLMs) (Konstantin et al., 2025).

With an estimated $391 billion in market value, the worldwide AI market is expected to grow rapidly, nearly five times to $1.81 trillion by 2030, driven by a compound annual growth rate (CAGR) of 35.9%. (Explodingtopics, 2025). The strong demand for computational resources is directly linked to this economic growth. According to reports, the amount of processing power needed to train advanced AI models doubles every 100 days (WEF, 2024). With AI data centers alone possibly needing 68 gigawatts of power globally by 2027, roughly equal to California's total 2022 power capacity, it has been predicted that the world's data center power demand could rise by 165% between 2023 and 2030 (Konstantin et al., 2025). A substantial and profitable market opportunity for alternative, distributed sources of computing power has been created because of this spike in demand from a well-capitalized and quickly growing industry. Idle GPUs from former miners and residential users may be a valuable resource to fill this gap.

Methodology

This paper aims to provide an insight into these two competing monetization strategies for residential GPU owners. The research is organized around three central analytical axes:

1. A comparative economic analysis of traditional PoW cryptocurrency mining versus the leasing of GPU computational power for AI workloads.
2. A comprehensive assessment of the intermediary platforms—mining pools and decentralized compute marketplaces—that facilitate these activities.
3. A specific case study analyzing the net profitability of each method under the real-world energy price fluctuations in Romania, a market characterized by relatively high electricity costs.

The principal contribution of this study is the development of a practical, evidence-based decision-making framework for individuals seeking to generate passive income from high-performance computing hardware. This framework is part of the new Decentralized Physical Infrastructure Networks (DePIN) business paradigm. From wireless and sensor networks to the digital resource networks of computing and storage that are the subject of this study, DePINs represent a revolutionary paradigm that builds and coordinates physical infrastructure networks in the real world using blockchain technology and crypto-economic incentives (Lin et al., 2025). This paper offers a concrete case study of the DePIN model in action by examining the transition from GPU mining to AI compute rental. It shows how the market has driven the model's transformation from a speculative, self-contained ecosystem to a utility-based model that offers a useful service to the larger technology industry.

The Economics of Proof-of-Work (PoW) Mining Post-Merge

The Ethereum Merge has significantly and probably permanently changed the economic environment for GPU-based PoW mining. A new reality marked by fierce competition, saturated networks, and decreased profitability has replaced the prior equilibrium, in which Ethereum acted as a lucrative backup for GPU processing capacity.

The saturation of other PoW coin networks was the direct result of the displacement of more than a Peta hash of GPU power. Network difficulty, which is a measure of how difficult it is to locate a block, drastically increased in order to maintain the scheduled block times while this enormous processing power spilled into smaller ecosystems like Ravencoin and Ethereum Classic. For each participant, this resulted in a direct and inverse relationship between the number of miners and profitability. Any given PoW network's total block rewards are determined by an algorithm over a predetermined time frame. The percentage attributable to any one miner decreases proportionately as more hashing power fights for this set pool of rewards.

This is how something called "profitability ceiling" for cryptocurrencies that can be mined using a GPU manifests. A portion of the enormous, dormant pool of now-idle ex-Ethereum GPUs will inevitably be drawn to a coin like Ravencoin if its market price rises to the point where mining it becomes noticeably profitable. The network difficulty will quickly increase due to this fresh inflow of hashrate, squeezing margins and driving profitability back down to a low-level equilibrium. Due to this self-regulating mechanism, which was created because of the enormous excess of GPU hashing power, no single PoW coin is able to maintain high levels of profitability for individual miners over an extended period of time. The atmosphere is now one of constant, fierce, and zero-sum competition for limited rewards rather than one of opportunity.

Several cryptocurrencies promote mining algorithms that are "ASIC-resistant," supporting the parallel processing architecture of consumer GPUs and, in some cases, CPUs, to challenge the dominance of specialized ASIC gear. Two notable examples are Monero's RandomX algorithm and Ravencoin's KAWPOW algorithm (Koinly.io, 2025). These algorithms' design philosophy is to demand a lot of memory bandwidth, a feature that GPUs excel at and that makes it more difficult to create affordable ASICs. The goal of this approach is to maintain decentralized mining that is available to anybody with consumer-grade gear.

ASIC resistance, however, does not ensure the economic feasibility of GPUs, even while it maintains their technological capacity to engage in these networks. These coins are equally affected by the post-merge saturation effect. At best, profitability is modest and highly susceptible to operating expenses, especially those related to energy. This fact is regularly shown by analysis from mining profitability calculators. Even mining the most optimized ASIC-resistant coins on a high-end GPU like the NVIDIA RTX 4090 frequently yields daily revenue that is either just above or, more commonly, much below the cost of electricity needed to run the gear, resulting in a net daily loss (Hashrate, 2025). Because of strong market pressures from hashrate saturation and rising energy costs, ASIC resistance is a required but insufficient prerequisite for profitability in this ecosystem.

The Economics of Decentralized Compute Leasing (DePIN Model)

Due to the AI industry's insatiable demand, a new economic model for GPU monetization has emerged alongside PoW mining's decline. This approach functions within the framework of Decentralized Physical Infrastructure Networks (DePIN), which organize dispersed hardware resources into a coherent network by utilizing token incentives and blockchain technology (Lin et al, 2025).

DePINs can be generally divided into two types: Digital Resource Networks, which combine fungible digital resources such as storage or, most pertinent to this paper, computational power, and Physical Resource Networks, which involve tangible, location-specific hardware such as wireless hotspots or sensors (Lin et al., 2025). Vast.ai and other GPU rental platforms are excellent illustrations of the DePIN model in action for digital resources. They serve as two-way markets that build a link between a consolidated, rapidly expanding demand side and a dispersed supply side. A global, dispersed network of people, former cryptocurrency miners, and independent data centers that rent out their idle GPU processing capacity make up the supply side. The demand side includes machine learning experts, AI researchers, startups, and even huge corporations that need a lot of processing capacity for tasks like inference, fine-tuning, and model training, but are looking for more affordable or easily available alternatives to standard cloud providers.

This decentralized compute platforms' advantage is their capacity to compile unused consumer-grade hardware and get it on the market for a fraction of the price of enterprise-grade solutions from centralized cloud giants like Microsoft Azure, Google Cloud Platform (GCP), and Amazon Web Services (AWS) (Vast.ai, 2025). The demand from the extremely cost-sensitive AI development community is strongly influenced by these platforms' ability to achieve notable price advantages by leveraging the pre-existing and primarily sunk-cost capital base of consumer GPUs.

The "flywheel effect" is a self-reinforcing economic cycle that is the goal of successful DePIN programs. In order to draw in an initial group of supply-side players, or GPU hosts, the platform offers incentives (often in the form of native protocol tokens or direct fiat-denominated payments). The network becomes more appealing to demand-side users as additional gear joins it, increasing its overall capacity and geographic diversity. Rental fees from the surge of users bring in money. This source of income confirms the network's usefulness, boosts demand for its native token (if any), and provides funding to encourage supply-side expansion further. The primary process by which DePINs seek to bootstrap and build large-scale infrastructure networks from the bottom up is a positive feedback loop: supply expansion leads to increased demand, which, in turn, drives further supply growth. This concept is positive-sum, in contrast to PoW mining's zero-sum nature; as the network grows, its overall value and usefulness increase, benefiting all users.

Assessment of intermediary platforms and ecosystems

In addition to choosing between two different revenue streams, choosing between cryptocurrency mining and GPU renting also means choosing between two different operational ecosystems, each with its own set of intermediary platforms, technical specifications, and risk profiles. Understanding the infrastructure that makes each activity possible for a home user is necessary for a thorough assessment.

Due to the enormous hash rate of worldwide networks, solo mining, the process of trying to locate a block alone, is statistically pointless for a single miner with one or a few GPUs. Participation in a mining pool is therefore practically required. By combining the hash rates of thousands of individual miners, mining pools increase the likelihood of finding a block. The rewards are then distributed to members according to the computational labor they have contributed.

2Miners, Nanopool, and Antpool are well-known pools that offer GPU-mineable currencies like Ravencoin and Monero. The way these pools distribute rewards is a crucial distinction that has an immediate effect on a miner's revenue stream and level of risk exposure. These are the two most popular models:

- → Pay Per Share (PPS/PPS+): Regardless of whether the pool finds a block within that time, miners in this scheme receive a set rate from the pool for each legitimate "share" of work they submit. By shifting the risk of block discovery "luck" from miners to pool operators, this strategy offers a relatively steady, predictable revenue stream. PPS pools usually demand higher fees, usually between 2% and 4%, to offset this risk.
- → Pay Per Last N Shares (PPLNS): Rewards are only given out in the PPLNS scheme when the pool genuinely discovers a block. Miners then split the reward based on how many shares they contributed to the most recent "N" shares added to the pool. This approach makes rewards less predictable by exposing miners to fluctuations in the pool's luck. However, because the pool operator is taking on less financial risk, it usually entails reduced fees, usually between 0.5% and 1.5%, and rewards enduring loyalty. With a 0% fee structure and extremely low reward thresholds, the decentralized P2Pool offers a trustless option for Monero in particular, thereby encouraging network decentralization.

Decentralized compute marketplaces that act as intermediaries dominate the GPU rental ecosystem. Vast.ai, the most well-known platform for consumer-grade hardware, has effectively established a sizable, thriving industry for GPU hosting and rental. Although there are other platforms, such as Lambda Labs, they are typically more concerned with offering expensive, enterprise-grade server instances than they are with enabling peer-to-peer consumer card rentals (Lambda.ai, 2025).

The goal of the Vast.ai business concept is to create a versatile marketplace. To make their computers available for rent, hosts (GPU providers) connect them to the network and set their own prices for different resources (GPUs, CPUs, RAM, and storage) (Vast.ai, 2025). The platform manages billing, client acquisition, and the software layer that enables clients to install containerized workloads on the host's computer, such as Docker images with PyTorch or TensorFlow. Payments for the rental period are made to hosts regularly following a two-week initial verification period (Vast.ai, 2025). Notably, Vast.ai reportedly removed direct hosting fees to promote supply-side involvement. Instead, it makes money from premium services or the difference between what hosts receive and what consumers pay (Vast.ai, 2025).

The two strategies present distinct risk profiles that a potential user must evaluate. One strategy is Cryptocurrency Mining Risks. Market-based and intrinsic to the cryptocurrency ecosystem are the main threats. Profits might be swiftly erased by the mined asset price volatility. A persistent obstacle that gradually reduces profitability is the growing difficulty of the network. For smaller cryptocurrencies, there is also the overall Regulatory Risk as governments around the world continue to develop policies regarding digital assets, as well as the Systemic Risk of a 51% attack, in which a malicious actor may take over the network. The second strategy is GPU Rental Risks. There are greater operational and platform-specific risks in this area. Platform risk is substantial; a host's revenue is heavily reliant on the intermediate platform's ongoing security, success, and market relevance. Market risk includes the possibility that rental rates will decline if the platform is overloaded with GPUs or demand from the AI industry declines. Hosts maintain their hardware and guarantee high uptime and dependability. They build a solid reputation, draw in customers, and take on technical risks. Lastly, allowing external users to run code on a personal computer connected to a public network poses security risks that require proper setup and security hygiene.

A summary comparison of the key intermediary platforms for each strategy is provided in Table 1.

Table 1. Comparison of key intermediary platforms

Feature	*Nanopool*	*2Miners*	*P2Pool (Monero)*	*Vast.ai*
Platform Type	Mining Pool	Mining Pool	Decentralized Mining Pool	GPU Marketplace
Supported Assets/Services	RVN, ETC, XMR, etc.	RVN, ETC, KAS, etc.	Monero (XMR)	GPU Compute Rental
Fee Structure	1%	1% (PPLNS), 1.5% (SOLO)	0%	No direct host fee; platform takes a spread
Payout Model	PPLNS	PPLNS / SOLO	PPLNS	Direct payment for the rented time
Minimum Payout	50 RVN	10 RVN	<0.0004 XMR	N/A (payout schedule based)
Target User	Crypto Miners	Crypto Miners	Monero Miners	GPU Owners / AI Developers

Source: www.nanopool.org, www.2miners.com, https://www.getmonero.org/es/2021/10/05/p2pool-released.html, www.vast.ai

Hardware selection and technical baselining

To make a realistic financial analysis, two representative high-performance consumer GPUs were selected: the NVIDIA GeForce RTX 4090 and the AMD Radeon RX 7900 XTX. These models were chosen for their use in the consumer market and their substantial 24GB VRAM capacity, which is a critical specification to work with large datasets and complex models that exist in modern AI and machine learning workloads.

An important component of the profitability model is assessing power consumption, as electricity is the primary cost driver for a residential user. The consumption varies significantly depending on the specific workload. Therefore, baseline power consumption figures were established for three distinct operational states: idle, cryptocurrency mining (specifically the KAWPOW algorithm, representative of intensive GPU mining), and AI training. These figures, synthesized from a wide array of technical reviews, user benchmarks, and manufacturer specifications, form the foundation of the cost analysis. For the model, the technical specifications and established power draw baselines are detailed in Table 2.

Table 2. Technical specifications and power consumption of high-performance GPUs

Feature	*NVIDIA GeForce RTX 4090*	*AMD Radeon RX 7900 XTX*
Architecture	Ada Lovelace	RDNA 3
VRAM	24 GB GDDR6X	24 GB GDDR6
Memory Bandwidth	1,008 GB/s	960 GB/s
FP32 TFLOPS (Theoretical)	82.58 TFLOPS	61.42 TFLOPS
Power Draw Idle (W)	~20 W	~30 W (Single Monitor, Optimized)
Power Draw Mining (Avg W, KAWPOW)	~300 W	~300 W
Power Draw AI Training (Avg W)	~450 W (TDP)	~355 W (TDP)

Note: Power draw figures are estimates based on an aggregation of sources. Idle power can be significantly higher with multi-monitor setups or non-optimized drivers. AI training power draw is assumed to be near the card's Total Design Power (TDP) for sustained, intensive workloads.
Source: information retrieved using the Gemini AI tool

Modeling revenue streams

Two distinct models were developed to project the potential gross revenue from each monetization strategy, accounting for their unique variables and risk factors.

The revenue from PoW mining is a function of the miner's share of the total network hashrate, the block reward, and the market price of the mined cryptocurrency. The daily gross revenue can be modeled by the formula:

$$Revenue_{rental} = Rate_{hourly} \times 24 \times Rate_{utilization}$$

Where:

Hashrate GPU - the computational power of the mining device
Hashrate Network - the total computational power of the entire network.
Blocks Day - how many blocks are mined across the whole network in one day.
Reward Block - how many coins are awarded for mining one block.
Price Coin - converts the expected number of coins into monetary revenue.

For this analysis, two representative GPU-mineable coins were selected: Ravencoin (RVN), which utilizes the GPU-optimized KAWPOW algorithm, and Monero (XMR), which uses the CPU/GPU-friendly RandomX algorithm. Hashrate data for the selected GPUs on these algorithms were sourced from established mining profitability calculators and benchmarks. A significant challenge in this model is the high volatility of its inputs; both the network hashrate (and thus difficulty) and the coin's market price are subject to rapid and unpredictable fluctuations, introducing substantial risk to the revenue stream.

The revenue from leasing GPU power on a decentralized marketplace is determined by the hourly rental rate, the number of hours in a day, and the proportion of time the GPU is actively rented and generating income. This is captured by the formula:

$$Revenue_{rental} = Rate_{hourly} \times 24 \times Rate_{utilization}$$

Where:

Hashrate GPU - the computational power of the mining device
Rate Utilization - it reflects how much of the time your hardware is actually rented.

The Hourly Rate for the RTX 4090 was extracted from the pricing data of the leading decentralized compute platform, Vast.ai, which provides a transparent marketplace for a wide range of consumer and enterprise GPUs. The most uncertain variable in this model is the Utilization Rate. Unlike mining, where a machine can run continuously, rental income is dependent on market demand. Based on evidence from platform users, a baseline utilization rate of 60% was assumed for the primary analysis. To account for uncertainty, sensitivity analysis was also performed for a lower-demand scenario (40% utilization) and a higher-demand scenario (80% utilization).

Operational cost structure

For a residential user, the single most significant operational expenditure (OpEx) is the cost of electricity consumed by hardware. The daily electricity cost is calculated using a straightforward formula that incorporates the GPU's power draw for a specific task, the duration of operation, and the local price of electricity:

$$Cost_{electricity} = \frac{PowerDraw_{GPU}}{1000} \times Hours_{operation} \times Price_{kWh}$$

Where:

Power Draw GPU is in Watts,
Hours Operation is 24 for continuous mining or 24×RateUtilization for renting,
Price kWh is the cost per kilowatt-hour.

The specific power draw figures for mining and AI workloads, as established in Table 2, will be used for these calculations.

Results and discussion

Case Study: Net profitability in romania

To synthesize the revenue and cost models into a practical outcome, a case study was conducted based on Romania's economic conditions. The study does not take into account the taxation aspect, as it is unclear what the new taxes will be. Taxation is also influenced by many factors, such as whether an entity or an unregistered person is receiving these incomes on an irregular basis. Also, the NACE codes for these activities are not clearly defined, so, in the case of a juridic person, it will be necessary to find the best fit among the existing codes. As the study analyses from the perspective of a residential user, the Net profitability is calculated as the difference between gross revenue and electricity costs:

$$Profit_{net} = Revenue_{gross} - Cost_{electricity}$$

In December 2024, the average residential electricity price in Romania was USD 0.183 per kWh, with all taxes and fees. This makes Romania one of the most expensive energy markets in the European Union, a factor that significantly influences the profitability of any energy-intensive enterprise (ANRE, 2024).

The termination of the Romanian government's energy price cap scheme on July 1, 2025, has been taken into account. After this date, prices returned to market rates, which are higher. Suppliers have post-cap tariffs, from 1.14 RON/kWh to 2.40 RON/kWh. For the study, an average of 1.55 RON/kWh has been used, which translates to approximately USD 0.33/kWh (ANRE, 2025). The analysis, therefore, calculates net profitability under both the capped price and the post-cap market price to provide a comprehensive view of the economic feasibility scenarios. The Romanian Energy Regulatory Authority (ANRE) provides a public tariff comparison tool to help consumers navigate this transition, though its practical utility has been noted as complex for the average user.

The final results of this comparative financial analysis for the NVIDIA RTX 4090, the more powerful and popular card for AI tasks, are summarized in Table 3.

Table 3. Financial analysis

Scenario	*Gross Monthly Revenue (USD)*	*Monthly Electricity Cost (Pre-July 2025 $0.183/kWh)*	*Net Monthly Profit (Pre-July 2025)*	*Monthly Electricity Cost (Post-July 2025 $0.33/kWh)*	*Net Monthly Profit (Post-July 2025)*
Mining Ravencoin (RVN)	$26.70	$39.53	$-12.83	$71.28	$-44.58
GPU Rental 40% Utilization	$89.28	$59.29	$29.99	$106.92	$-17.64
GPU Rental 60% Utilization	$133.92	$88.94	$44.98	$160.38	$-26.46

GPU Rental 80% Utilization	$178.56	$118.58	$59.98	$213.84	$-35.28

Notes: Assumes 30 days/month. RVN mining revenue based on a hash rate of 65 MH/s and an average daily revenue of $0.89 before electricity costs (nicehash). GPU rental revenue based on a Vast.ai median hourly rate of $0.31 for an RTX 4090 (vast.ai). Power consumption is 300 W for mining and 450 W for AI workloads (Table 2).

Traditional GPU mining of a representative PoW coin like Ravencoin is already unprofitable under prior Romanian electricity costs, resulting in a monthly loss of about $12.83. However, even at a cautious 40% utilization rate, renting the same GPU for AI workloads is profitable, resulting in a net profit of $29.99 per month. When utilization is at the baseline of 60%, this profit rises to $44.98. Both businesses become unprofitable when the energy price cap is removed, but mining incurs losses that are significantly higher than those from renting, highlighting the latter model's better economic efficiency.

Synthesized findings and a decision-making framework

Leasing GPU power for AI workloads is clearly more profitable and economically resilient than traditional cryptocurrency mining for residential users in a jurisdiction with high energy costs, such as Romania. The combination of financial modeling and platform assessment supports this conclusion. Even under cautious assumptions, renting can yield a modest profit, whereas mining results in a net loss, as demonstrated by the quantitative figures presented in Table 3. While the GPU mining business is characterized by saturation and diminishing returns, the rental market is linked to a growth industry (AI), according to the qualitative analysis.

A useful framework for decision-making can be suggested for people considering these possibilities based on these findings. This approach comprises a step-by-step assessment of important environmental and personal factors. Hardware Assessment is very important because the user must first evaluate their hardware. Is the GPU a high-performance model (e.g., RTX 3080/4080/4090 series) with sufficient VRAM (ideally 12GB+, with 24GB being optimal) to be attractive for AI workloads? Lower-end or older cards may not be competitive on rental marketplaces. Local Cost Analysis must be made because the single most critical factor is the local, all-in price of electricity per kilowatt-hour. The user must calculate this accurately. As demonstrated by the Romanian case study, a high electricity cost can turn even a positive gross revenue stream into a net loss. A price above ~$0.20-0.25/kWh makes traditional mining very challenging. Risk Tolerance Evaluation is another step.

The user must assess their appetite for different types of risk. Are they more comfortable with the extreme price volatility and systemic risks of the cryptocurrency markets, or with the platform dependency and technical uptime risks of the rental market? Technical Proficiency and Time Commitment are important issues: The user must consider their own technical skills and available time. While setting up a mining rig is relatively straightforward, maintaining a secure and reliable host for a rental platform, ensuring high uptime, managing security, and troubleshooting network issues - requires a greater degree of technical knowledge and ongoing commitment to be successful.

The hybrid strategy: a model for maximizing utilization

The choice between mining and renting ignores a more complex and maybe best course of action: a hybrid strategy that takes advantage of the unique economic features of both markets to optimize hardware utilization and anticipated profits. This approach reframes the choice between "mining OR renting" as "Renting as Primary, Mining as Filler."

There is strong economic justification for this approach. High hourly rates and excellent profit margins are available when renting a GPU for AI workloads, but demand may fluctuate, resulting in varying utilization rates and expensive downtime. On the other hand, cryptocurrency mining offers extremely low, frequently negative, profit margins in the current climate. However, it does offer a way to make some money whenever the hardware is on but not in use. As a "profitable standby mode," it can partially offset the costs associated with idle electricity.

This precise approach is made possible by platforms such as Vast.ai. When the machine is not actively rented for a higher-paying on-demand project, its host software enables the configuration of "background tasks," such as mining, to run automatically. For on-demand AI rentals, a host can thus establish a competitive, high-margin price. The AI task begins when a client chooses their machine, pausing the mining software. The system immediately switches back to mining as soon as the rental period ends. This hybrid strategy brings the GPU's overall utilization rate closer to 100% by enabling the host to profit from the substantial upside and high margins of the AI compute market while leveraging low-margin mining to monetize the downside risk of idle time. The most cost-effective approach for a home user looking to get the most out of their hardware investment is this dynamic optimization.

The future of distributed infrastructure: from speculation to utility

More than just a market adjustment, the observed shift in the profitability of GPU monetization from mining to AI compute renting is indicative of a larger development in the decentralized technology space. It marks a significant shift from largely self-referential, speculative use cases to concrete, utility-driven models that offer significant benefits to major external sectors.

Despite its technological innovation, cryptocurrency mining is an inherently self-contained economic cycle in which the network's native token is obtained in exchange for the processing resources used to secure it. The value is mostly based on conjecture of the token's future value. This cycle is broken by the DePIN model for compute rental. In this case, the decentralized hardware network is doing more than just protecting itself; it is offering TFLOPS of processing power, a tangible and quantifiable service, to an external market that clearly and urgently needs it. The amount of money made is linked to the budgetary allotments and the development trajectory of the global artificial intelligence sector, rather than being exclusively reliant on the mood of the cryptocurrency market.

This development suggests a time when consumer-owned hardware networks can come together to create a distributed, worldwide supercomputer under the direction of decentralized protocols. Such a network might enable more affordable, censorship-resistant, and robust access to the fundamental instruments of creativity, thereby challenging the existing oligopoly of centralized cloud providers. This turns the user's powerful PC from a tool for consumption or speculative mining into a productive capital asset, a tiny but useful node in a new, decentralized digital economy. This paradigm has the potential to democratize access not only to passive income streams but also to the very computational resources required to construct the next generation of artificial intelligence.

Conclusions

This study compared the economics of two main strategies for making money from home high-performance GPUs: leasing computing capacity for AI tasks and mining traditional Proof-of-Work for cryptocurrencies. Fundamental changes like the Ethereum merger and the 2024 Bitcoin halving have significantly reduced GPU mining's profitability, resulting in a crowded market with constantly squeezed margins. At the same time, the AI sector's rapid expansion has created a significant demand for processing capacity, opening a new and profitable market for GPU rentals.

This concept was quantitatively proven through financial modeling conducted in a case study in Romania, an area with high energy costs. The findings showed that using a top-tier GPU, such as the NVIDIA RTX 4090, to mine representative PoW coins, like Ravencoin, leads in a net monthly loss. On the other hand, even with cautious assumptions regarding utilization rates, renting the same hardware on a decentralized compute marketplace such as Vast.ai can result in a net monthly profit. The analysis also revealed that these losses worsened following Romania's elimination of energy price caps, making mining a far poorer financial prospect and leaving both operations unprofitable.

The Romanian case study demonstrates that by simply removing a government energy price cap can turn a profitable activity into a net monthly loss. As a result, success in this ecosystem is fundamentally dependent on long-term local energy regulations, which have a more profound impact than hardware performance.

This paper draws the conclusion that, in the current techno-economic landscape, renting computational power to AI-focused platforms is a demonstrably better and more financially viable monetization strategy than traditional cryptocurrency mining for residential users with modern, high-performance GPUs. While the GPU mining strategy is limited by a zero-sum competitive environment and dwindling rewards, the rental model is bolstered by a strong growth tendency in a significant external industry. The rental market has operational and platform-specific risks, but these are outweighed by an underlying economic base that is more robust and scalable. A mixed strategy that favors high-margin AI rentals and uses automated mining to monetize any resulting idle time is the best way to maximize returns.

An effective example of how decentralized technologies have evolved is the shift from mining to AI compute leasing. It represents a dramatic shift away from crypto-native, speculative economies and into a "utility phase," in which distributed networks offer real, useful services to the global economy as a whole. This change indicates a new form of a distributed digital economy, which not only provides people with a more feasible way to earn passive income but also helps build a more accessible and democratic foundation for AI innovation.

The transition from cryptocurrency mining to AI rental (DePIN) requires adaptation in the user involvement area. If, in the mining activity, the user had to set up the rig and afterward it only needed to passively run via pools, the case is different for acting as a GPU host, which requires active management.

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