

## DeepBlock: a decentralized approach to hardware acceleration for deep learning.

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GPU computing power is critical to both neural network training and blockchain mining, the underlying processes of two job growth areas prime to explode. However, ASIC hardware accelerators have become sparse, costly, and continues to be energy exhaustive. Blockchain mining, for example, arguably in its infancy as an industry, consumes more electricity than 159 real-world countries combined a year – about 25.09 TWh and increasing (Forbes, 2018). Cloud-computing service providers make use of server virtualization to drastically consolidate server deployment to fewer devices at fewer data centers, thus, wasting less energy. Moreover, a new trend coined *spot computing*, for the purpose of this paper, affords practitioners in both AI and Blockchain sectors the ability to rent hardware accelerators at fractional rates.

The problem is centralized server virtualization leaves a massive carbon footprint. For example, Facebook reported a total carbon footprint of 979,000 metric tons in 2017 (Facebook Sustainability, 2018) and with more companies opting to make the the shift to build applications on top of renewable energy sources, centralized server virtualization will likely cease to be a viable option (Mokhtari, 2017). The spot computing approach also presents challenges to the flow of training neural networks, as virtual instances can stop abruptly and thwart the training process. Tangentially, growing popularity of *Proof-of-Stake*, an alternative blockchain consensus system to the current *Proof-of-Work* system, may transpose existing wealth disparities to the network and threatens the longevity of the mining economy and its annual profits. To demonstrate the size of this market, Bitman, a Chinese-based bitcoin mining firm with majority stake in ASIC hardware, made approximately \$3.5 billion in profit in 2017 (Fortune, 2018).

This paper presents the architecture and ongoing progress made on *DeepBlock* – an open-source, blockchain-based, decentralized computing network at the intersection of deep learning, blockchain and energy – in preparation of private alpha testing. DeepBlock coordinates the load, demand, and trust of a network designed to facilitate peer-to-peer ensemble learning. DeepBlock employs **Stochastic Weight Averaging (SWA)** as a proof of work algorithm for the base chain, together with the **Interplanetary File System (IPFS)** as a decentralized storage solution, to dispatch ad-hoc sessions of tensor mining for more energy efficient transfer learning. Second, this paper outlines how DeepBlock will be benchmarked and discusses why distributed parallel processing creates new trajectories for the mining labor force, builds the capacity to train more AI, and is easily translatable to Android mobile in light of new advancements with application processors (AP) (Hardesty, 2018).

### References

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