

Proof of Useful Work (PoUW) is a novel blockchain consensus protocol used to improve efficiency and security of blockchain. Classical Bitcoin mining is a wasteful and resource-intensive process as its Proof of Work (PoW) protocol resembles a lottery and the underlying computational work is not useful otherwise. To add a block of transactions to the blockchain, miners spend a considerable amount of energy. By comparison, PoUW is based on training a machine learning model on the blockchain and does not rely only on the lottery procedure.

Users can participate in PoUW as different roles: clients submit machine learning training tasks to the network; miners get a chance to create new coins after performing honest units of machine learning training work; coordinators manage and supervise the training work. Their activities not only support the blockchain but also contribute to solving real-world problems: training machine learning models. Meanwhile client's privacy is preserved as machine learning tasks are computed in a distributed manner instead of being managed by a single party. We aim to build better AI systems using the security of the blockchain.

In this paper, we briefly reviewed related PoUW proposals and outlined the unique characteristics of our solution. We proposed a system where nonces for blockchain mining are obtained with a formula that takes into consideration inputs and by-products of the machine learning training. We implemented a proof of concept and showed that our solution is more cost-friendly to a client than regular cloud ML training, but also more profitable to miners compared to Bitcoin mining. Our approach also shows that ML models can be trained collectively with good performance using commodity hardware owned by individuals.

Diagrams

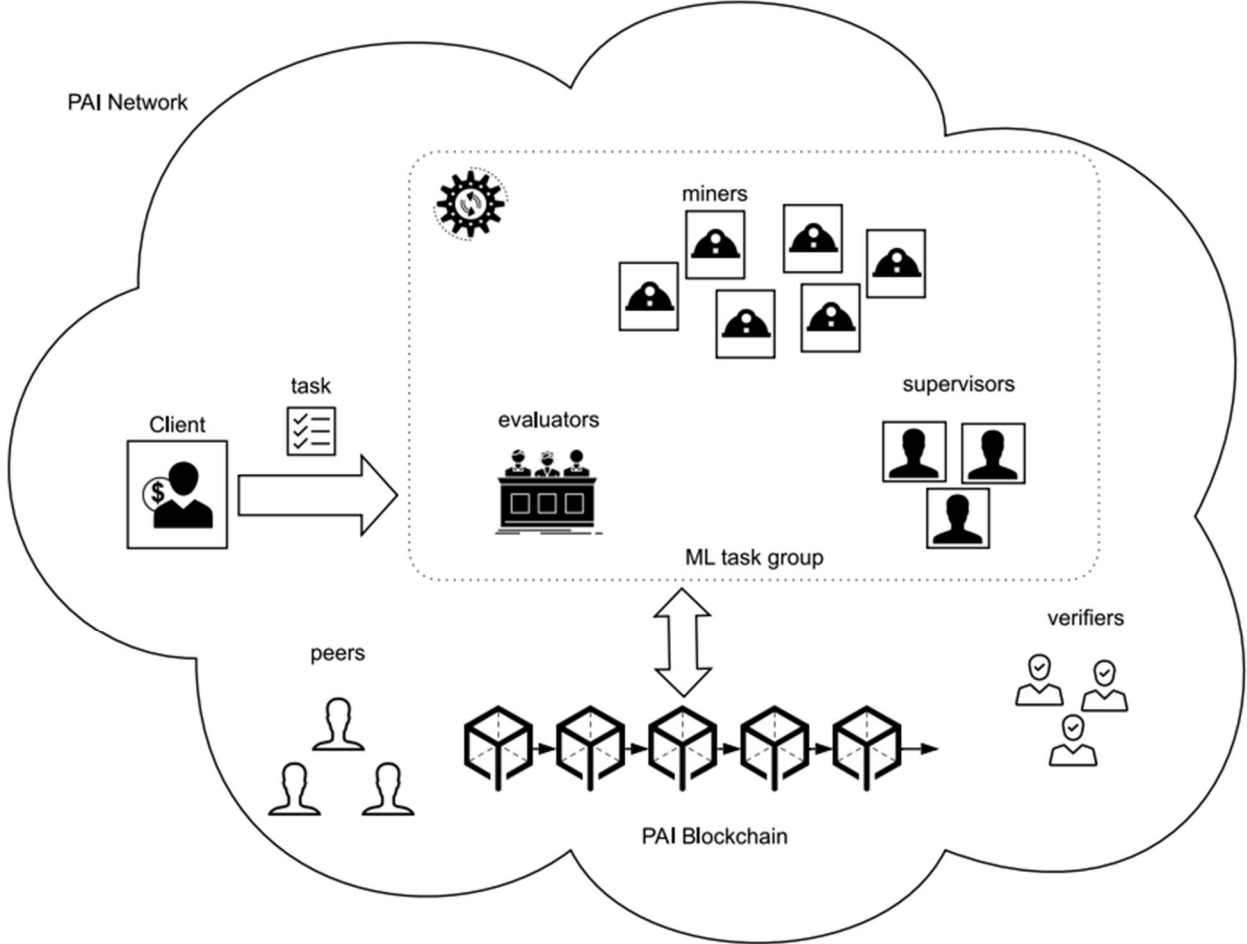


Figure 1. System architecture

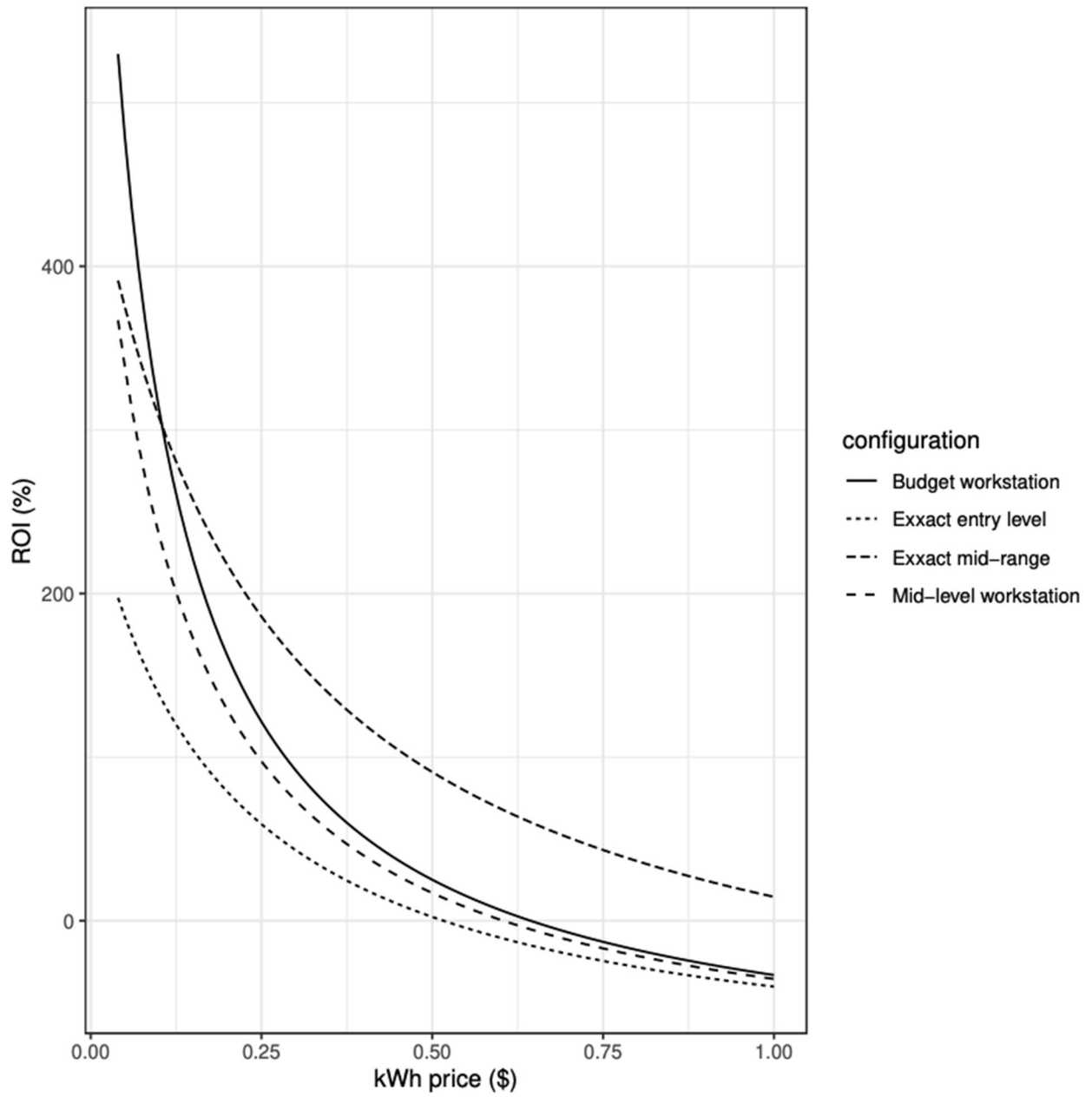


Figure 2. ROI (%) as a function of electricity price.