

# Researchers demystify centralization in cryptocurrency mining

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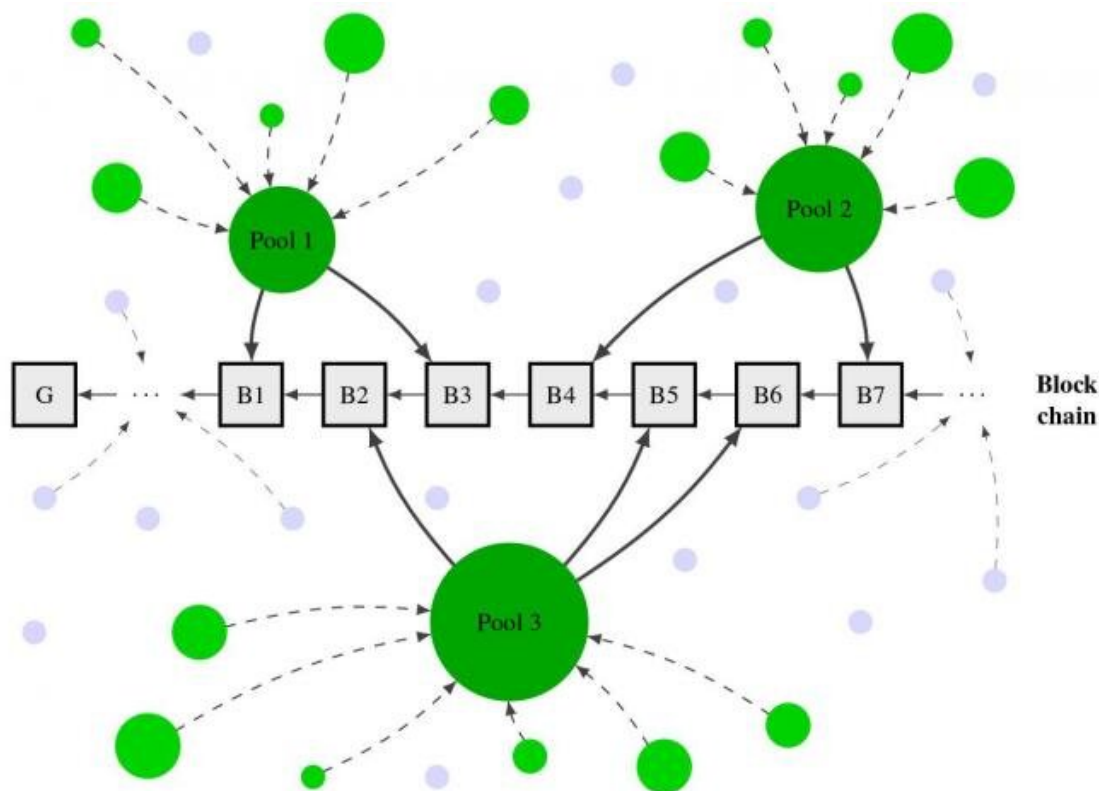


Illustration of centralization in Blockchain Mining. Several major mining pools dominate the process. The remaining resources are scattered among 'Oceanic Miners.' Credit: SUTD

Blockchain technology has been considered as the most revolutionizing invention since the internet. Due to its immutable nature and the

associated security and privacy benefits, it has attracted the attention of banks, governments, technology corporations, as well as venture capital.

To participate in the blockchain consensus mechanisms, prospective network nodes—also called miners—need to provide proof of some costly resource. This resource may be [computational power](#) in protocols with proof of work mechanisms or [cryptocurrency](#) coins in proof of stake mechanisms.

An integral assumption in the security philosophy of public blockchains is that the network of [mining](#) nodes remains sufficiently decentralized and distributed. In the extreme case, sufficiently means that no single entity holds 50 percent or more of the resources, but in practice, much more decentralization may be desired to safeguard the underlying protocol.

However, available data demonstrates that mining resources are much more centralized than originally thought, leading essentially to a reinvention of our current banking system instead of the intended decentralized digital currency of the future (Figure 1).

Assistant Professor Georgios Piliouras of Singapore University of Technology and Design and his collaborators developed a novel approach to untangle the centralization phenomena in blockchain mining. They employed the rich economic theory of Oceanic Games, originally devised by the 2012 Nobel Laureate in Economics, Lloyd S. Shapley.

The application of this theory in the currently evolving blockchain ecosystem unveiled incentives both for active and for newly entering miners to merge and act as single entities. These observations provide an alternative justification of the observed centralization and concentration of power in the mining process of major cryptocurrencies. Contrary to

common perceptions, they amount to the existence of a negative feedback loop in terms of decentralization as a core ingredient in public [blockchain](#) philosophy and reveal the need for further research in this direction.

Provided by Singapore University of Technology and Design

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