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Comprehensive Insight into Blockchain Technology: Past Development, Present Impact and Future Considerations

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Abstract

Blockchain technology is based on the idea of a distributed, consensus ledger, which it employs to create a secure, immutable data storage and management system. It is a publicly accessible and collectively managed ledger enabling unprecedented levels of trust and transparency between business and individual collaborations. It has both robust cryptographic security and a transparent design. The immutability feature of blockchain data has the potential to transform numerous industries. People have begun to view blockchain as a revolutionary technology capable of identifying "The Best Possible Solution" in various real-world scenarios. This paper provides a comprehensive insight into blockchains, fostering an objectual understanding of this cutting-edge technology by focusing on the theoretical fundamentals, operating principles, evolution, architecture, taxonomy, and diverse application-based manifestations. It investigates the need for decentralisation, smart contracts, permissioned and permissionless consensus mechanisms, and numerous blockchain development frameworks, tools, and platforms. Furthermore, the paper presents a novel compendium of existing and emerging blockchain technologies by examining the most recent advancements and challenges in blockchain-enabled solutions for a variety of application domains. This survey bridges multiple domains and blockchain technology, discussing how embracing blockchain technology is reshaping society's most important sectors. Finally, the paper delves into potential future blockchain ecosystems providing a clear picture of open research challenges and opportunities for academics, researchers, and companies with a strong fundamental and technical grounding.

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Blockchain ; Blockchain applications; Consensus algorithms; Distributed ledger; Smart contract

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