

Understanding Blockchain Technology

Simanta Shekhar Sarmah

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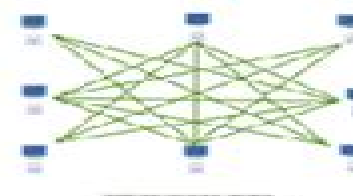
Abstract Blockchain is one of the most important technical invention in the recent years. Blockchain is a transparent money exchange system that has transformed the way a business is conducted. Companies and tech giants have started investing significantly in the blockchain market and it is expected to be net worth of more than 3 trillion dollars in next 5 years. It has become growing popular because of its irrefutable security and ability to provide complete solution to digital identity issues. It is a digital ledger in a peer to peer network. This paper provides a background on Blockchain technology, history, its architecture, how it works, advantages and disadvantages and its application in different industries.

Keywords Blockchain, Cryptocurrency, Bitcoin, Peer-to-Peer Network, Decentralized Ledger, Nodes, Token

1. What is Blockchain

Blockchain technology is normally associated with cryptocurrencies such as Bitcoin. It is a database of record of transactions which is distributed, and which is validated and maintained by a network of computers around the world. Instead of a single central authority such as a bank, the records are supervised by a large community and no individual person has control over it and no one can go back and change or erase a transaction history. As compared to a conventional centralized database, the information cannot be manipulated due to blockchain's built in distributed nature of structure and confirmed guarantees by the peers. In another words, when a normal centralized database is located on an individual server, blockchain is distributed among the users of a software. Blockchain allows anyone on the network to access everyone else's entries which makes it impossible for one central entity to gain control of the network. Whenever someone performs a transaction, it goes to the network and computer algorithms determine the authenticity of the transaction. Once the transaction is verified, this new transaction is linked with the previous transaction forming a chain of transactions. This chain is called the blockchain.

Blockchain technology is based on decentralized network meaning it operates as a peer to peer network.



One of the most popular blockchain technology is Bitcoin which hosts a digital ledger. Bitcoin provides the platform to mine, store and trade bitcoins via a complex computer algorithm which is tied to a distributed network. Blockchains can be not only used for transactions but it can be considered as registry and inventory for all assets.

2. History of Blockchain

In the year 1976, a paper was released on "New Directions in Cryptography" discussed the concept of distributed ledger. With the advancement in the field of Cryptography, another paper entitled as "How to Time-Stamp a Digital Document" by Stuart Haber and Scott Stornetta which laid out the concept to timestamp the data instead of the medium. Another important concept called as "Electronic cash" or "Digital Currency" which came into existence based on a model proposed by David Chaum also contributed towards the development of the concept of Blockchain which was followed by Protocols such as e-cash schemes that introduced double spending detection.

In 1997, Adam Back introduced another concept called "b-money" which offered a solution to control spam emails. This lead to the concept of creating money called as "b-money" by Wei Dai based on peer to peer network.

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Joseph Lee



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Blockchain Hans-Georg Fill, Andreas Meier, 2020-03-14 Sowohl in der Praxis als auch der wissenschaftlichen Forschung ist das Thema Blockchain aktuell von großem Interesse. Noch scheint sich die Technologie am Anfang ihrer Entwicklung zu befinden. Plattformen wie Bitcoin, Ethereum, Hyperledger Fabric, Libra, TradeLens oder andere weisen bereits einen beeindruckenden Reifegrad in ihrer technischen Entwicklung auf. Dennoch befinden sich erst wenige von ihnen bzw. darauf aufbauende Applikationen im produktiven Einsatz bei Unternehmen. Hier können nicht nur Forschende optimal dazu beitragen, neue Ideen zu entwickeln, noch nicht betrachtete Anwendungsfälle und Domänen zu untersuchen und erste Prototypen für den konkreten Einsatz zu entwickeln. Die Beiträge der vorliegenden Edition HMD bieten dazu einen umfassenden Überblick und zeigen die große Bandbreite an möglichen Anwendungsfeldern für Blockchains. Das Herausgeberwerk vermittelt somit die Grundlagen zur Blockchain-Technologie, widmet sich den Smart Contracts und beschreibt wichtige Anwendungsszenarien, erste Fallbeispiele und rechtliche Aspekte. Wie typisch für die Fachbuchreihe Edition HMD greifen die Beitragsautoren das Thema aus Sicht von Forschung und Praxis gleichermaßen auf. Ein Glossar mit den wichtigsten Begriffen rundet das Buch ab.

Fintechs Dieter Krimphove, 2019-11-25 Die Bankenbranche ist getrieben vom digitalen Wandel. Fintech-Unternehmen drängen mit innovativen Geschäftsideen auf den Markt. z.B. Alternative Bezahlverfahren, Blockchain-Technologie, Crowdfunding, Automatisierte Finanzportfolioverwaltung, Plattformen zur automatisierten Anlageberatung. Das Fachbuch befasst sich mit den rechtlichen Grundlagen von Fintechs. Darüber hinaus werden angrenzende Rechtsthemen wie Datenschutz, IT, Geldwäsche, Marktmissbrauch und Aufsichtsrecht beleuchtet, und die rechtliche Bewertung einzelner Fintechs erläutert.

Mathematical Research for Blockchain Economy Panos Pardalos, Ilias Kotsireas, Yike Guo, William Knottenbelt, 2020-02-13 This book presents the best papers from the 1st International Conference on Mathematical Research for Blockchain Economy (MARBLE 2019) held in Santorini, Greece. While most blockchain conferences and forums are dedicated to business applications, product development, or Initial Coin Offering (ICO) launches, this conference focused on the mathematics behind blockchain to bridge the gap between practice and theory. Every year, thousands of blockchain projects are launched and circulated in the market, and there is a tremendous wealth of blockchain applications from finance to healthcare, education, media, logistics, and more. However, due to theoretical and technical barriers, most of these applications are impractical for use in a real-world business context. The papers in this book reveal the challenges and limitations, such as scalability, latency, privacy, and security, and showcase solutions and developments to overcome them.

Handbook of Blockchain Technology Marinos Themistocleous, 2025-02-12 This Handbook provides an interdisciplinary investigation into the role and influence of blockchain technology in areas such as the Metaverse, Non-Fungible Tokens (NFTs), tokenization, algorithmic governance, fraud, and crime prevention. Drawing on cutting-edge research and analysis from leading experts in the field, it demystifies the complex nature of blockchain and its

mechanisms applications and potentials *Proceedings of International Conference on Data Science and Applications*
Mukesh Saraswat, Chandreyee Chowdhury, Chintan Kumar Mandal, Amir H. Gandomi, 2023-02-06 This book gathers
outstanding papers presented at the International Conference on Data Science and Applications ICDSA 2022 organized by
Soft Computing Research Society SCRS and Jadavpur University Kolkata India from 26 to 27 March 2022 It covers
theoretical and empirical developments in various areas of big data analytics big data technologies decision tree learning
wireless communication wireless sensor networking bioinformatics and systems artificial neural networks deep learning
genetic algorithms data mining fuzzy logic optimization algorithms image processing computational intelligence in civil
engineering and creative computing **International Handbook of Blockchain Law** Thomas Richter, Matthias
Artzt, 2024-08-14 Blockchain's significant advances since 2020 including a plethora of new use cases have necessitated a
comprehensive revision of the first edition of this matchless resource While new chapters and topics have been added the
handbook still follows the systematic and structured approach of the first edition Each contributor all of them practitioners
experienced with blockchain projects within their respective areas of expertise and specific jurisdictions elucidates the
implications of blockchain technology and related legal issues under such headings as the following understanding
blockchain from a technological point of view regulatory aspects of blockchain smart contracts data privacy capital markets
crypto asset regulation in Europe the UK and the US intellectual property and antitrust law The foundational chapter on the
technical aspects of blockchain technology has been meticulously expanded to elucidate the proof of stake consensus
mechanism alongside fresh insights into the ERC 721 Token Standard for non fungible tokens decentralized exchanges
staking stablecoins and central bank digital currencies As blockchain law cements itself as a distinct legal field this new
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blockchain associations and legal scholars At a depth that allows non IT experts to understand the groundwork for legal
assessments the handbook provides those charting the dynamic waters of this field of law with a compass ensuring they are
well equipped to tackle the legal issues raised by the usage of blockchain technology *Blockchain and AI Technology in the
Industrial Internet of Things* Pani, Subhendu Kumar, Lau, Sian Lun, Liu, Xingcheng, 2021-01-08 Blockchain and artificial
intelligence AI in industrial internet of things is an emerging field of research at the intersection of information science
computer science and electronics engineering The radical digitization of industry coupled with the explosion of the internet
of things IoT has set up a paradigm shift for industrial and manufacturing companies There exists a need for a
comprehensive collection of original research of the best performing methods and state of the art approaches in this area of
blockchain AI and the industrial internet of things in this new era for industrial and manufacturing companies Blockchain and
AI Technology in the Industrial Internet of Things compares different approaches to the industrial internet of things and
explores the direct impact blockchain and AI technology have on the betterment of the human life The chapters provide the

latest advances in the field and provide insights and concerns on the concept and growth of the industrial internet of things While including research on security and privacy supply chain management systems performance analysis and a variety of industries this book is ideal for professionals researchers managers technologists security analysts executives practitioners researchers academicians and students looking for advanced research and information on the newest technologies advances and approaches for blockchain and AI in the industrial internet of things *Blockchain Foundations and Applications* Xun Yi,Xuechao Yang,Andrei Kelarev,Kwok Yan Lam,Zahir Tari,2022-08-20 This monograph provides a comprehensive and rigorous exposition of the basic concepts and most important modern research results concerning blockchain and its applications The book includes the required cryptographic fundamentals underpinning the blockchain technology since understanding of the concepts of cryptography involved in the design of blockchain is necessary for mastering the security guarantees furnished by blockchain It also contains an introduction to cryptographic primitives and separate chapters on bitcoin ethereum and smart contracts public blockchain private blockchain cryptocurrencies and blockchain applications This volume is of great interest to active researchers who are keen to develop novel applications of blockchain in the field of their investigatio Further it is also beneficial for industry practitioners as well as undergraduate students in computing and information technology Handbook of Blockchain Law Matthias Artzt,Thomas Richter,2020-07-16 Blockchain has become attractive to companies and governments because it promises to solve the age old problem of mutability in transactions that is it makes falsification and recalculation impossible once a transaction has been committed to the technology However the perceived complexity of implementing Blockchain calls for an in depth overview of its key features and functionalities specifically in a legal context The systematic and comprehensive approach set forth in this indispensable book including coverage of existing relevant law in various jurisdictions and practical guidance on how to tackle legal issues raised by the use of Blockchain ensures a one stop shop reference book for anyone considering Blockchain based solutions or rendering advice with respect to them Within a clear structure by fields of law allowing for a systematic approach each contributor all of them are practitioners experienced with Blockchain projects within their respective areas of expertise elucidates the implications of Blockchain technology and related legal issues under such headings as the following technical explanation of Blockchain technology contract law regulatory issues and existing regulation in a variety of jurisdictions data protection and privacy capital markets information security patents and other intellectual property considerations and antitrust law Keeping the legal questions and concepts sufficiently generic so that lawyers can benefit from the handbook irrespective of their jurisdiction and legal background the authors cover such specific characteristics of Blockchain implementation as so called smart contracts tokenization distributed ledger technology digital securities recognition of code as law data privacy challenges and Blockchain joint ventures Because Blockchain is a relatively new technology still in process and raises a multitude of legal questions this well balanced introduction at a depth that allows non IT experts to understand the

groundwork for legal assessments provides a solid basis for organizations and their legal advisors in identifying and resolving Blockchain related issues Legal practitioners in house lawyers IT professionals and advisors consultancy firms Blockchain associations and legal scholars will welcome this highly informative and practical book **Wie erzielen Sie mit**

Kryptowährungen bombastische Gewinne? Oder verlieren das letzte Hemd? Alen Menetyan,2020-10-27 Bitcoin und Blockchaintechnologie f r Anleger in Bezug aufs Portfolio Sind Kryptow hrungen etwas f r ihr Portfolio Was bewirkt ein kleiner Anteil an Kryptos in ihr Portfolio in Bezug auf Rendite und Risiko Wie viele Kryptow hrungen Welche Strategien brauchen Sie Welche Voraussetzungen m ssen Sie erf llen damit Sie erfolgversprechend im Kryptow hrungsmarkt unterwegs sind Wie gehen Sie in diesem Bereich am Besten vor Hier finden Sie alles ber Kryptow hrungen in Bezug auf ihr Portfolio Auch alternative Investmentm glichkeiten werden besprochen Und wieso ein kleiner Anteil an Kryptow hrungen einen grossen Einfluss auf die Rendite hat bei minimal steigendem Risiko Vergessen Sie trotz allem nicht dass Bitcoin Co sehr riskant sind doch auch eine unglaubliche Chance pr sentieren **Blockchains and the Token Economy** Mary C.

Lacity,Horst Treiblmaier,2022-08-10 In this book leading practitioners and academics provide comprehensive coverage and novel insights into blockchains and the token economy Real world case studies from a wide range of industries provide practical examples of blockchain based tokens for real estate logistics insurance recruitment collectibles reservations metaverses and more The cases show how tokens provide an innovative way to create and transfer value without relying on traditional intermediaries Readers will better understand the business and social benefits of tokenization but also its challenges Chapter 3 and Chapter 8 are available open access under a Creative Commons Attribution 4 0 International License via link springer com **Smart IoT for Research and Industry** Melody Moh,Kanta Prasad Sharma,Rashmi

Agrawal,Vicente Garcia Diaz,2021-07-15 This book covers a variety of smart IoT applications for industry and research For industry the book is a guide for considering the real time aspects of automation of application domains The main topics covered in the industry section include real time tracking and navigation smart transport systems and application for GPS domains modern electric grid control for electricity industry IoT perspectives for modern society IoT for modern medical science and IoT automation for Industry 4 0 The book then provides a summary of existing IoT research that underlines enabling technologies such as fog computing wireless sensor networks data mining context awareness real time analytics virtual reality and cellular communications The book pertains to researchers outcome based academic leaders as well as industry leaders **Blockchain for Financial Governance in Malaysia and Singapore** Ming Sen Thong,2025-01-29 Through an interdisciplinary approach that combines insights from finance technology and regulation this book provides a comprehensive understanding of the potential impact of blockchain technology on financial compliance and inclusion in Malaysia and Singapore In doing so the book examines real world challenges and innovative solutions which contributes to scholarly discourse and informs policymaking efforts in the region It does so by focusing on three key areas Regulatory

Compliance Shariah Compliance in Islamic Finance and Financial Inclusion *Digital Finance and Regulatory Competition*
Lucien van Romburg, 2024-11-21 International Banking and Finance Law Series 39 Digital Finance and Regulatory
Competition Regulating Distributed Ledger Technology Based Financial Products and Services Lucien J van Romburg
Governments like people compete against each other but do so in a bid to achieve their myriad socio economic and political
aims In the operation of regulatory competition governments may create rules with the intent of attracting capital and labour
to their domains In the twenty first century regulatory competition takes on a new dimension in the face of the rapid
advancement of digital finance The role of financial technology fintech as a tool through which governments achieve their
aims cannot be overstated The proliferation of distributed ledger technologies DLT marked a watershed moment for
technological advancement and presented a ripe opportunity for governments to defend their competing claims for resources
In this context this book tackles the question of whether the world s leading financial centres Hong Kong London and New
York engaged in regulatory competition against each other through their creation of rules to govern DLT based financial
products and services during the period 2008 until 2022 In answering this question this book provides a cohesive framework
for understanding the influence of regulatory competition on rule creation using a narrative lens based on a comparative
study of legal regulatory and policy instruments The lessons distilled from the analysis provide reasoned observations on the
potential implications for the future regulation of financial products and services underlined by novel technologies The topics
covered in this book which concern the timely intersection of regulatory competition and fintech include the emergence and
impact of DLT its core features types use cases and applications in the financial services industry origins of regulatory
competition from Charles Tiebout to the regulatory races to the top and bottom formulation of a definitional matrix which
provides a cohesive framework for understanding regulatory competition regulatory frameworks for DLT based financial
products and services in Hong Kong London and New York and potential impact of regulatory competition on the future
regulation of financial products and services underlined by novel technologies This book represents one of the very few
studies comprehensively tackling the topic of regulatory competition through the guise of fintech It will deepen the
understanding of lawmakers policymakers and regulators concerning the influence and significance of regulatory
competition The discussion surrounding the regulation of DLT based financial products and services will also be of interest to
practitioners students and general readers alike Blockchain Radicals Joshua Dávila, 2023-08-08 Blockchain Radicals
uncovers the radical political potential of the blockchain showing how it can be used by the left in the fight against capitalism
Over the last decade blockchains and crypto have opened up a new terrain for political action It is not surprising however
that the crypto space has also become overrun by unscrupulous marketing theft and scams The problem is real but it isn t a
new one Capitalism has ruined crypto but that shouldn t be the end of it Blockchain Radicals shows us how this has happened
and how to fix crypto in a way that is understandable for those who have never owned a cryptocurrency as well as those who

are building their own decentralised applications Covering everything from how Bitcoin saved WikiLeaks to decentralised finance worker cooperatives the environmental impact of Bitcoin and NFTs and the crypto commons it shows how these new tools can be used to challenge capitalism and build a better world for all of us While crypto is often thought of as being synonymous with unbridled capitalism Blockchain Radicals shows instead how the technology can and has been used for more radical purposes beyond individual profit and towards collective autonomy

The Digital Revolution in Banking, Insurance and Capital Markets Lech Gąsiorkiewicz, Jan Monkiewicz, 2023-02-22 The digital transformation of finance and banking enables traditional services to be delivered in a more effective and efficient way but at the same time presents crucial issues such as fast growing new asset classes new currencies datafication and data privacy algorithmization of law and regulation and last but not least new models of financial crime This book approaches the evolution of digital finance from a business perspective and in a holistic way providing cutting edge knowledge of how the digital financial system works in its three main domains banking insurance and capital markets It offers a bird s eye view of the major issues and developments in these individual sectors The book begins by examining the wider framework of the subsequent analysis and over the next three parts discusses the opportunities risks and challenges facing the digitalization of these individual financial subsectors highlighting the similarities and differences in their digitalization agenda as well as the existing linkages and dependencies among them The book clarifies the strategic issues facing the development of digital finance in these major subsectors over the coming years The book has three key messages that digital transformation changes fundamentally the way financial businesses operate that individual trades have their own digitalization agenda and that the state with its regulatory power and central banking and money has a particularly important role to play It will be of interest to scholars students and researchers of finance and banking as well as policymakers wishing to understand the values and limitations of new forms of digital money

Kryptowährungen und Token Sebastian Omlor, Mathias Link, 2023-03-22 Auch in seiner Neuauflage bereitet das vorliegende Handbuch alle wichtigen Themen aus den Bereichen Blockchain Technologie Kryptowährungen und Token systematisch sowie didaktisch sinnvoll auf und bietet Anwendern die Möglichkeit sich rasch in diese neuen Gebiete einzuarbeiten Das Handbuch stellt zunächst die ökonomischen und technischen Grundlagen von Kryptowährungen und Token dar und befasst sich dann vertieft mit deren ökonomischen zivil aufsichts bilanz und steuerrechtlichen Implikationen Neben der Seite des Emittenten wird jeweils auch die Perspektive des Inhabers von Kryptowährungen und Token beleuchtet Anmerkungen zum Wettbewerbs Datenschutz Geldwäsche und Strafrecht sowie internationale Perspektiven runden die Darstellung ab Erweitert wurde die Neuauflage insbesondere um die folgenden Themen aktuelle Entwicklungen der deutschen wie europäischen Gesetzgebung z B eWpG MiCAR 6 EU Geldwäscherichtlinie technologische Neuerungen z B NFT die europäische wie internationale Debatte um digitales Zentralbankgeld CBDC Ausblick auf Web3 und Decentralized Finance DeFi die steuerlichen und bilanziellen Aussagen im BMF Schreiben vom 10 Mai 2022

Blockchain in Health Sciences

Aryan Chaudhary,Rashmi Singh,Gaurav Agarwal,2025-08-26 The book provides a comprehensive understanding of how blockchain technology can revolutionize healthcare by improving patient outcomes enhancing data privacy and driving innovative solutions to industry challenges Blockchain in Health Sciences is an essential roadmap for navigating the complex landscape of blockchain technology in healthcare From foundational concepts to real world applications this book empowers understanding to harness the potential of blockchain to improve patient outcomes enhance data privacy and optimize healthcare delivery Delve into the integration of blockchain with the Internet of Things and AI to uncover groundbreaking solutions for challenges faced by the healthcare industry Gain insights into the regulatory and ethical implications of blockchain in healthcare ensuring responsible and effective implementation Each chapter unveils the current uses of blockchain in drug discovery drug and device tracking real world data collection and increased patient engagement used to unlock opportunities to advance health sciences research This book is an essential guide for readers exploring opportunities to empower and enable data in health science research Readers will find the volume Introduces the fundamentals of blockchain and its integration with IoT in healthcare Provides practical applications across patient records drug supply chains and genomics research Explores the synergy of AI IoT and blockchain for unprecedented healthcare advancements Audience Healthcare professionals researchers policymakers IT experts and anyone interested in the future of healthcare

Blockchain for Industry 4.0 Anoop V.S.,Asharaf S,Justin Goldston,Samson Williams,2022-12-23 This reference text provides the theoretical foundations the emergence and the application areas of Blockchain in an easy to understand manner that would be highly helpful for the researchers academicians and industry professionals to understand the disruptive potentials of Blockchain It explains Blockchain concepts related to Industry 4 0 Smart Healthcare and the Internet of Things IoT and explores Smart Contracts and Consensus algorithms This book will serve as an ideal reference text for graduate students and academic researchers in electrical engineering electronics and communication engineering computer engineering and information technology This book Discusses applications of blockchain technology in diverse sectors such as industry 4 0 education finance and supply chain Provides theoretical concepts applications and research advancements in the field of blockchain Covers industry 4 0 digitization platform and blockchain for data management in industry 4 0 in a comprehensive manner Emphasizes analysis and design of consensus algorithms fault tolerance and strategy to choose the correct consensus algorithm Introduces security issues in the industrial internet of things internet of things blockchain integration and blockchain based applications The text presents in depth coverage of theoretical concepts applications and advances in the field of blockchain technology This book will be an ideal reference for graduate students and academic researchers in diverse engineering fields such as electrical electronics and communication computer and information technology *Crypto-Finance, Law and Regulation* Joseph Lee,2022-02-17 Crypto Finance Law and Regulation investigates whether crypto finance will cause a paradigm shift in regulation from a centralised model to a model based on distributed

consensus This book explores the emergence of a decentralised and disintermediated crypto market and investigates the way in which it can transform the financial markets It examines three components of the financial market technology finance and the law and shows how their interrelationship dictates the structure of a crypto market It focuses on regulators enforcement policies and their jurisdiction over crypto finance operators and participants The book also discusses the latest developments in crypto finance and the advantages and disadvantages of crypto currency as an alternative payment product It also investigates how such a decentralised crypto finance system can provide access to finance promote a shared economy and allow access to justice By exploring the law regulation and governance of crypto finance from a national regional and global viewpoint the book provides a fascinating and comprehensive overview of this important topic and will appeal to students scholars and practitioners interested in regulation finance and the law

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