1. **Title:** Blockchain-Enhanced AI System for Secure Data Transactions and Management
2. **Prior-Art**
3. **Relevant Prior Art Patents and Applications**
4. **US Patent No. 10,643,202** (Bank of America)
    - **Title**: Real-Time Processing of Transactions in a Digital Ledger System
    - **Summary**: This patent describes a method for real-time processing of transactions using a digital ledger. It includes receiving a transfer request, validating data records through unique identifiers, and ensuring real-time transfer of resources. This approach contrasts with batch-processing methods, aiming to accelerate blockchain transaction speeds, which is critical for applications like e-commerce.
    - **Relevance**: The method for real-time transaction processing using unique identifiers is pertinent to our system's emphasis on secure, efficient data transactions (IP Watchdog).
5. **US Patent No. 10,579,779** (nChain Holdings Limited)
    - **Title**: Verifying the Integrity of a Digital Asset Using a Distributed Hash Table and Peer-to-Peer Ledger
    - **Summary**: This patent covers methods for verifying digital asset integrity using a distributed hash table and a peer-to-peer ledger. The process involves generating hash values to ensure proper distribution and licensing of software.
    - **Relevance**: Ensuring data integrity through distributed ledgers aligns with our system's goal of maintaining secure and transparent data transactions (IP Watchdog).

6. **US Patent No. 11,727,795 B1** (Hayden AI)
    - **Title**: Blockchain-Powered Data Management System for Traffic Enforcement Applications
    - **Summary**: This patent involves a blockchain system for managing traffic enforcement data, ensuring a verifiable chain of custody for each data package through unique cryptographic identifiers.
    - **Relevance**: The use of blockchain for secure data management and chain of custody is directly relevant to our system's data security objectives (Business Wire).
7. **Patent Application by Veritaseum Capital, LLC**
    - **Title**: Methods for Processing Economic Transactions Using Decentralized Digital Currency Network
    - **Summary**: This application addresses processing transactions using a decentralized network, focusing on abstract economic transaction concepts without intermediaries.
    - **Relevance**: While this application emphasizes decentralized transaction processing, its reliance on generic blockchain features without inventive concepts highlights the uniqueness of our system's integrated AI and blockchain approach (Kramer Levin).
8. **IPwe Platform and Global Patent Registry (IBM Collaboration)**
    - **Title**: AI and Blockchain-Powered Patent Management Platform

- **Summary**: The IPwe platform uses AI and blockchain to enhance patent management, including smart contracts for transactions and a global patent registry.
- **Relevance**: The integration of AI and blockchain in patent management and transaction automation provides a comparable approach to our system's aim of automating data transactions and management (IBM - United States).

9. Analysis and Distinguishing Aspects

- Our "Blockchain-Enhanced AI System for Secure Data Transactions and Management" integrates advanced AI processing capabilities with a decentralized blockchain ledger to ensure robust, secure, and efficient data transactions. The distinguishing aspects include:
- **Advanced AI Integration**: Unlike the cited patents, our system leverages AI for real-time data analysis, pattern recognition, and predictive analytics, optimizing transaction processes beyond traditional blockchain applications.
- **Smart Contract Automation**: Our system employs smart contracts to automate transaction execution based on predefined rules, enhancing security and efficiency without the need for intermediaries.
- **User Interface and Customizable Dashboards**: The system offers a user-friendly interface with customizable dashboards, allowing real-time monitoring and data analytics, which is not highlighted in the prior art.
- **Cross-Industry Applications**: While existing patents focus on specific applications (e.g., financial transactions, software integrity, traffic enforcement),

our system is designed to be scalable and adaptable across various industries, including finance, supply chain, and healthcare.

10. By emphasizing these innovative features, our system not only addresses the limitations of existing technologies but also offers a comprehensive solution that enhances data security, transaction efficiency, and transparency across multiple domains.
11. **Technical Field**
12. This invention relates to blockchain technology, specifically to a blockchain-enhanced AI system designed to secure data transactions and management across various industries, providing high monetary value through enhanced security, efficiency, and transparency.
13. **Background of the Invention**
14. The integration of blockchain technology and artificial intelligence (AI) has the potential to revolutionize data transactions and management. Traditional methods of data handling face challenges related to security, transparency, and efficiency. Blockchain provides a decentralized ledger system that ensures data integrity and transparency, while AI offers powerful tools for data analysis and decision-making. However, there is a need for a unified system that leverages both blockchain and AI to enhance data security, optimize transaction processes, and manage data efficiently.
15. **Summary of the Invention**
16. The present invention is a blockchain-enhanced AI system designed to secure data transactions and management. The system integrates blockchain's decentralized ledger with AI's advanced data processing capabilities to provide a robust, secure, and efficient solution for various industries. This innovation aims to enhance data security, optimize

transaction processes, and provide transparent and immutable records of data transactions.

17. **Brief Description of the Drawings**
18. **Figure 1: System Architecture Overview (101)**
19. **Description**: This figure shows the overall architecture of the blockchain-enhanced AI system, including the blockchain network, AI processing unit, smart contracts, and user interface.
20. **Explanation of Each Element**
    - **Data Entry and Initiation**:
        - Data enters through the **User Interface (102)**, where users initiate transactions and input data.
    - **Data Processing by AI Unit**:
        - Data flows to the **AI Processing Unit (103)**, where it is analyzed using machine learning algorithms.
    - **Data Recording in Blockchain Network**:
        - Processed data is recorded in the **Blockchain Network (104)**, ensuring data integrity and transparency.
    - **Execution of Smart Contracts**:
        - The **Smart Contracts (105)** are triggered, automating the execution of transactions based on predefined conditions.
    - **Feedback and Display**:
        - Results and real-time analytics are sent from the **Smart Contracts (105)** back to the **User Interface (102)** for user interaction and monitoring.

21. **Figure 2: Blockchain Network (201)**
22. **Description**: A detailed view of the blockchain network component, showing nodes and data transaction flows.
23. **Explanation of Each Element**
    - **Blockchain Nodes (202)**:
        - **Function**: Nodes are individual participants in the network that validate and record transactions. Each node maintains a copy of the blockchain ledger, ensuring data integrity and transparency. This is a decentralized network.
    - **Data Transactions (203)**:
        - **Function**: Arrows represent the flow of data transactions between nodes. Transactions are verified and recorded by the nodes, ensuring they are consistent across the entire network. The bidirectional nature indicates that nodes can send and receive transactions.
24. **Figure 3: AI Processing Unit (301)**
25. **Description**: A detailed view of the AI processing unit, including sub-components such as machine learning algorithms and data analysis modules.
26. **Explanation of Each Element**
    - **AI Processing Unit (302)**:
        - **Function**: The AI Processing Unit is the core component that processes data using advanced AI techniques. It houses various sub-components that perform specific AI-related tasks.
    - **Machine Learning Algorithms (303)**:

- **Function**: This sub-component includes algorithms such as natural language processing (NLP), predictive analytics, and reinforcement learning. It is responsible for analyzing data and making intelligent decisions based on patterns and historical data.

- **Data Analysis Modules (304)**:
  - **Function**: These modules perform detailed data analysis, processing the inputs received and generating insights that are used by the system to optimize transactions and data management.
- **Arrows** show the flow of data between the Machine Learning Algorithms and Data Analysis Modules within the AI Processing Unit.

27. **Figure 4: Smart Contracts (401)**
28. **Description**: A diagram illustrating the structure and execution of smart contracts within the blockchain network.
29. **Explanation of Each Element**

- **Smart Contracts (402)**:
- **Function**: This block represents the smart contracts that automate transaction processes based on predefined rules and conditions. It ensures that transactions are secure, transparent, and executed without intermediaries.
- **Contract Rules (403)**:
- **Function**: This sub-component contains the predefined rules that govern the execution of smart contracts. These rules determine the conditions under which transactions are processed.

- **Arrow** from the Contract Rules to the Transaction Conditions indicate how rules govern the execution of transactions.
- **Transaction Conditions (404)**:
- **Function**: This sub-component includes the specific conditions that need to be met for a transaction to be executed. It ensures that all necessary criteria are fulfilled before a transaction is completed.

30. **Figure 5**: **Figure 5: User Interface (501)**
31. **Description**: A diagram of the user interface, showing customizable dashboards and real-time data analytics.

32. Explanation of Each Element

- **User Interface (502)**:
  - **Function**: This block represents the user interface of the system. It is the main point of interaction between the user and the system, providing access to various features and functionalities.
- **Customizable Dashboards (503)**:
  - **Function**: This feature allows users to customize their view of the system, including arranging widgets, choosing data points to display, and configuring alerts. It enhances user experience by providing a personalized interface.
- **Real-Time Data Analytics (504)**:
  - **Function**: This feature provides real-time analysis of data, displaying metrics such as transaction speeds, security alerts, and data trends. It

enables users to monitor the system's performance and make informed decisions based on live data.

33. **Detailed Description of the Invention**

34. Clear and Complete Explanation

35. The invention integrates blockchain technology with artificial intelligence (AI) to enhance the security, efficiency, and transparency of data transactions and management across various industries. The system comprises four main components: a blockchain network, an AI processing unit, smart contracts, and a user interface. Each component plays a critical role in ensuring the system functions effectively and securely.

36. Best Mode

37. The best mode for carrying out the invention involves deploying the system within a financial institution to secure and optimize financial transactions. This mode leverages the AI processing unit for predictive analytics, analyzing transaction patterns while the blockchain network ensures data integrity and transparency. Smart contracts automate transaction processes, reducing the need for intermediaries and minimizing transaction times. The user interface provides real-time data analytics, allowing users to monitor system performance and make informed decisions.

38. Embodiments

39. **Financial Transactions**:

- **Implementation**: A financial institution uses the system to secure and optimize transactions. Users initiate transactions through the user interface. The AI processing unit analyzes transaction data for patterns and anomalies. The

blockchain network records each transaction immutably, and smart contracts automate the execution of transactions based on predefined conditions.

- **Specific Example**: A bank processes customer transactions through the system. A customer initiates a transfer of funds through the bank's application (user interface). The AI processing unit verifies the customer's identity using machine learning algorithms, checks for fraud, and approves the transaction. The blockchain network records the transaction, and a smart contract executes the transfer of funds once all conditions (e.g., sufficient balance, verified identity) are met.

40. **Supply Chain Management**:

- **Implementation**: The system is used to track and manage goods across the supply chain. The AI processing unit analyzes data from IoT devices, providing real-time insights into the status of goods. The blockchain network records each transaction and transfer of goods, while smart contracts automate payment and transfer processes.
- **Specific Example**: A logistics company uses the system to manage shipments. Sensors (IoT devices) on shipping containers provide real-time data on the location and condition of goods. The AI processing unit analyzes this data to predict potential delays or issues. Each movement and transaction is recorded on the blockchain, ensuring transparency. Smart contracts automatically release payments when goods reach their destination and meet specified conditions.

41. **Healthcare Data Management**:

- **Implementation**: In the healthcare industry, the system manages patient data securely. The AI processing unit analyzes patient data for trends and anomalies, aiding in diagnostics and treatment. The blockchain network ensures the integrity and confidentiality of patient records, while smart contracts automate data sharing between authorized healthcare providers.
- **Specific Example**: A hospital uses the system to manage electronic health records (EHR). When a patient visits, their data is entered through the user interface. The AI processing unit analyzes historical and current health data to assist in diagnosis. Patient records are stored on the blockchain, ensuring they are tamper-proof. Smart contracts facilitate the sharing of patient records with specialists, ensuring only authorized access.

42. Terminology and Definitions

- **Blockchain Network**: A decentralized ledger that records and verifies data transactions.
- **AI Processing Unit**: A component that uses machine learning algorithms to analyze data in real-time.
- **Smart Contracts**: Self-executing contracts with predefined rules and conditions.
- **User Interface**: A platform for users to interact with the system, initiate transactions, and access real-time analytics.

43. Function and Operation

44. **Data Entry and Initiation**:

- Users interact with the system through the user interface, initiating transactions and inputting data. For example, in a financial application, a user may initiate a funds transfer.

45. **Data Processing**:

- The AI processing unit analyzes incoming data using advanced machine learning algorithms. It identifies patterns, predicts outcomes, and makes intelligent decisions to optimize transaction processes. For instance, in supply chain management, it might predict delivery times and detect potential issues.

46. **Data Recording**:

- Processed data is recorded in the blockchain network. The decentralized nature of the blockchain ensures that data is immutable and transparent. Each transaction is validated by network nodes.

47. **Execution of Smart Contracts**:

- Smart contracts automate the execution of transactions based on predefined rules and conditions. For example, a smart contract in a healthcare application might automatically update a patient's record when new test results are available.

48. **Feedback and Monitoring**:

- Results and real-time analytics are displayed on the user interface. Users can monitor transaction histories, view system alerts, and access customizable dashboards to tailor their view of the system.

49. Advantages and Improvements

50. **Enhanced Data Security**:

- The integration of blockchain technology ensures data integrity and transparency, reducing the risk of data breaches and unauthorized access. Advanced encryption protocols further enhance security.

51. **Optimized Transaction Processes**:

- The AI processing unit optimizes transactions by analyzing data in real-time and making intelligent decisions. Smart contracts reduce the need for intermediaries and minimize transaction times.

52. **Transparent Data Management**:

- The decentralized nature of the blockchain ensures that all data transactions are transparent and immutable. The user interface provides real-time data analytics, allowing users to make informed decisions.

53. **Scalability and Integration**:

- The system is designed to integrate seamlessly with existing IT infrastructure, including databases, ERP systems, and IoT devices. It is scalable to accommodate varying transaction volumes and data management needs.

54. Alternative Configurations

55. **Cross-Chain Interactions**:

- The system can interface with other blockchain networks to facilitate cross-chain transactions, broadening its applicability and interoperability.

56. **Multi-User Access**:

- The user interface supports multi-user access with role-based permissions, ensuring that different users have access to the functionalities they need.

57. Detailed Examples

58. **Example 1: Financial Transactions**:

- A financial institution uses the system to secure and optimize transactions. A customer initiates a transfer of funds through the bank's application (user interface). The AI processing unit verifies the customer's identity using machine learning algorithms, checks for fraud, and approves the transaction. The blockchain network records the transaction, and a smart contract executes the transfer of funds once all conditions (e.g., sufficient balance, verified identity) are met.

59. **Example 2: Supply Chain Management**:

- A logistics company uses the system to manage shipments. Sensors (IoT devices) on shipping containers provide real-time data on the location and condition of goods. The AI processing unit analyzes this data to predict potential delays or issues. Each movement and transaction is recorded on the blockchain, ensuring transparency. Smart contracts automatically release payments when goods reach their destination and meet specified conditions.

60. **Example 3: Healthcare Data Management**:

- A hospital uses the system to manage electronic health records (EHR). When a patient visits, their data is entered through the user interface. The AI processing unit analyzes historical and current health data to assist in diagnosis. Patient records are stored on the blockchain, ensuring they are tamper-proof. Smart contracts facilitate the sharing of patient records with specialists, ensuring only authorized access.

61. This enhanced detailed description provides a comprehensive and robust understanding of the invention, ensuring that someone skilled in the relevant field can replicate and utilize the patent effectively.

Claims

1. A blockchain-enhanced AI system for secure data transactions and management comprising:

    A blockchain network, AI processing unit, smart contracts, and a user interface;

    A blockchain network designed to record and verify all data transactions in a decentralized ledger.
2. The system of claim 1, wherein the AI processing unit uses machine learning algorithms for real-time data analysis and decision-making.
3. The system of claim 1, wherein smart contracts automate transaction processes based on predefined rules and conditions.
4. The system of claim 1, wherein the user interface provides real-time data analytics, transaction histories, and customizable dashboards.
5. The system of claim 1, wherein the system integrates with existing IT infrastructure and is scalable to accommodate varying transaction volumes.
6. The system of claim 1, wherein advanced encryption protocols ensure data security and compliance with data protection regulations is maintained.
7. The system of claim 1, wherein the AI processing unit includes algorithms such as natural language processing (NLP), predictive analytics, and reinforcement learning.
8. The system of claim 1, wherein the blockchain network uses consensus mechanisms to verify transactions.
9. The system of claim 1, wherein the smart contracts are programmed to handle multiple types of transactions, including financial, supply chain, and healthcare data exchanges.

10. The system of claim 1, wherein the user interface supports multi-user access with role-based permissions.
11. The system of claim 1, wherein the system provides audit trails for all transactions to ensure transparency and accountability.
12. The system of claim 1, wherein the AI processing unit continuously monitors and adapts to transaction patterns to improve efficiency and security over time.
13. The system of claim 1, wherein the blockchain network can interface with other blockchain networks to facilitate cross-chain transactions.
14. The system of claim 1, wherein the system includes APIs for integration with third-party applications.
15. The system of claim 1, wherein the user interface includes real-time alerts and notifications for significant events or anomalies in transaction data.

Abstract

1. A blockchain-enhanced AI system designed to secure data transactions and management. The system integrates a decentralized blockchain ledger with AI's data processing capabilities, offering a secure, efficient, and transparent solution for various industries. Features include smart contracts for automated transactions, real-time data analysis, and a user-friendly interface. The system ensures data security and compliance with data protection regulations, making it suitable for applications in finance, supply chain, healthcare, and more. By combining blockchain's immutable ledger with AI's predictive analytics and decision-making capabilities, the invention provides a robust framework for secure and efficient data management.