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AI-Powered Genetic Disease Risk Analyzer with Blockchain-Based Consent Management

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ABSTRACT: Genomic science is transforming modern healthcare by enabling predictive diagnostics, identification of genetic risks, and the development of personalized treatment plans. Despite its potential, the management of genetic data raises critical concerns regarding privacy, security, and patient control. Current centralized systems are prone to cyberattacks and offer limited transparency in data access and sharing. To address these challenges, this project proposes an AI-Powered Genetic Disease Risk Analyzer with Blockchain-Based Consent Management. The system integrates Artificial Intelligence (AI) for disease risk prediction, symptom forecasting, and lifestyle recommendations with Blockchain technology and Interplanetary File System (IPFS) for secure, decentralized storage and dynamic consent management. Blockchain smart contracts ensure transparent and tamper-proof control over data sharing, allowing patients to grant or revoke access at any time. The solution also includes a user-friendly patient portal or mobile application, ensuring compliance with global data protection standards such as HIPAA and GDPR. By combining AI-driven analytics with blockchain-enabled security, this project delivers a comprehensive, patient-centric, and privacy-preserving healthcare solution that promotes trust, transparency, and improved clinical outcomes.

KEYWORDS: Genomic Science, Artificial Intelligence (AI), Blockchain, Consent Management, IPFS, Genetic Disease Prediction, Personalized Healthcare, Data Security, Privacy Preservation, HIPAA, GDPR, Decentralized Storage, Smart Contracts, Patient-Centric System, Healthcare Innovation

I. INTRODUCTION

The world of healthcare is rapidly transforming with the help of emerging technologies such as artificial intelligence and blockchain. Genomic science, in particular, is opening new doors for understanding the human body at a genetic level. It allows doctors and researchers to predict the likelihood of diseases, identify genetic disorders, and provide personalized treatment plans for every individual. However, despite these advancements, one major concern still remains — the privacy and security of genetic data. Since genetic information is deeply personal and unique to each individual, any misuse or unauthorized access could lead to serious consequences such as discrimination or privacy violations.

Our project, AI-Powered Genetic Disease Risk Analyzer with Blockchain-Based Consent Management, has been designed to address these challenges. It integrates artificial intelligence, blockchain technology, and decentralized storage to build a secure and intelligent healthcare ecosystem. The AI component analyzes a patient's genetic data to predict potential health risks and suggest preventive measures such as lifestyle changes, dietary recommendations, or early medical checkups. This helps in detecting diseases at an early stage and promotes a proactive approach to health management.

Blockchain technology ensures that all patient data remains private and transparent. Every access request, whether from a doctor, researcher, or healthcare organization, must go through a smart contract that verifies patient consent. Patients have full control over who can view their data, for what purpose, and for how long.
The patient can revoke access at any time, and the system automatically updates this decision on the blockchain, maintaining complete transparency and security.

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In this system, genetic data is encrypted and stored in decentralized storage using IPFS, preventing it from being altered or lost. AI models process this encrypted data without exposing any personal details, ensuring privacy even during analysis. The system also includes a doctor recommendation feature that suggests suitable specialists near the patient's location based on their predicted health risks, creating an end-to-end healthcare workflow — from prediction to consultation.

The aim of this project is to create a responsible and trustworthy healthcare solution that places patient empowerment at its core. By combining the power of artificial intelligence for medical predictions and blockchain for consent management, this project represents a step toward a future where healthcare is intelligent, secure, transparent, and patient-centered

II. OVERVIEW

The AI-Powered Genetic Disease Risk Analyzer with Blockchain-Based Consent Management is an advanced healthcare solution designed to enhance personalized medicine through secure, intelligent, and patient-centered management of genetic data. By integrating artificial intelligence, blockchain technology, and decentralized storage, the system continuously analyzes genetic information to predict disease risks, recommend preventive measures, and suggest lifestyle or dietary changes. It monitors patient data in real-time, ensuring early detection of potential health issues while automating personalized health recommendations.

The blockchain-based consent management ensures that patient data remains private and transparent. Every access request from doctors, researchers, or healthcare organizations is verified through smart contracts, giving patients full control over who can view their data, for what purpose, and for how long, with the ability to revoke access anytime. Encrypted genetic data is securely stored using decentralized storage like IPFS, preventing unauthorized modifications or data loss while maintaining privacy during AI analysis.

The cloud-based platform enables remote monitoring and interaction via an interactive dashboard, allowing patients and healthcare providers to access real-time insights, receive alerts, and manage consultations seamlessly. Additional features include AI-powered doctor recommendations based on predicted health risks, creating a complete workflow from disease prediction to specialist consultation.

Future enhancements include mobile application integration, advanced analytics for preventive healthcare, and expanded AI capabilities for even more accurate predictions. This system offers a scalable, user-friendly, and secure approach to healthcare, reducing manual intervention, optimizing patient care, and promoting responsible, data-driven health management

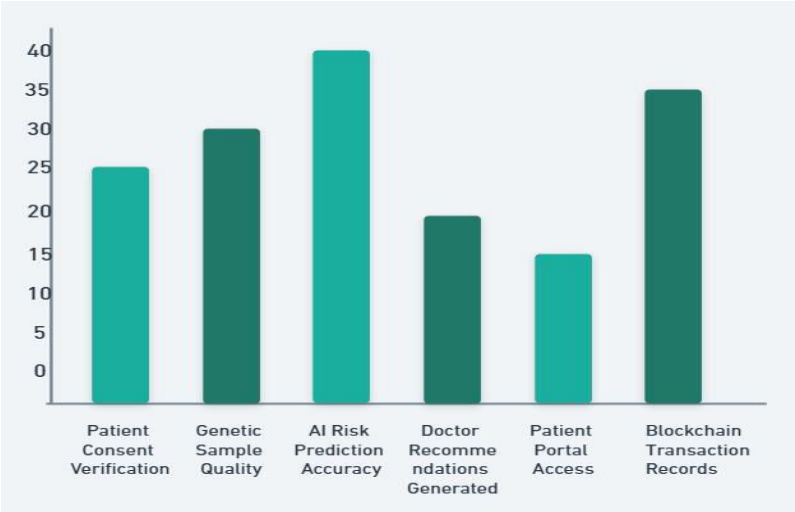

Fig 1: Overview of genetic risk analyzer Paramneters

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III. COMPONENTS

HARDWARE SPECIFICATIONS:

1. Microcontroller:
   - Raspberry Pi 4 / NVIDIA Jetson Nano – Processes genetic data, runs AI models, and manages secure communication with the blockchain and cloud.
2. Data Input Devices:
   - DNA Sequencer / Genetic Data Upload Interface – Accepts patient genetic information in standard formats (FASTQ, VCF).
   - Biometric/Health Sensors (Optional) – Collects additional health parameters like heart rate, blood pressure, or glucose levels.
3. Storage & Security Devices:
   - Secure Storage Modules – Encrypts and stores sensitive genetic data locally before uploading to decentralized storage (IPFS).
4. Connectivity & Interface:
   - Wi-Fi /Ethernet Modules – Enables cloud-based interaction for remote monitoring.
   - LCD/LED Display or Dashboard Interface – Shows real-time analysis and alerts.

SOFTWARE SPECIFICATIONS:

1. AI & Data Analysis:
   - Python libraries (TensorFlow, PyTorch, Scikit-learn) for disease risk prediction and data processing.
2. Blockchain & Security:
   - Smart contract frameworks (Solidity, Ethereum, Hyperledger) for consent management.
   - IPFS or other decentralized storage solutions for secure data storage.
   - Encryption libraries (AES, RSA) for data privacy.
3. Communication & Integration:
   - REST APIs / HTTPs for cloud and blockchain communication.
   - MQTT or WebSocket's for real-time alerts and updates.
4. User Interface:
   - Web-based or cloud dashboards for patient and doctor access.
   - Mobile app integration for notifications and remote monitoring.
5. Programming & Development Platforms:
   - Python and C++ for AI, hardware control, and blockchain interaction.
   - Cloud platforms (AWS, Google Cloud, or Firebase) for hosting, storage, and analytics.
6. Alert & Recommendation System:
   - Automated notification system for critical health risks and doctor recommendations.

IV. EXISTING SYSTEM

Currently, healthcare systems store patient genetic and medical data in centralized databases, and disease risk predictions rely mostly on general medical history or limited lab tests, providing minimal personalization. Patients have little control over who accesses their data, making it vulnerable to breaches and misuse, and there is no automated system to link predictive insights with doctor consultations. Manual intervention is often required for data management, and real-time preventive recommendations are lacking. Our system overcomes these drawbacks by combining AI for personalized disease risk analysis, blockchain for secure and patient-controlled data access, and decentralized storage to prevent data loss. It also provides automated alerts, lifestyle recommendations, and doctor suggestions, creating a secure, efficient, and patient-centered healthcare solution with minimal manual effort**.**

V. PROPOSED SYSTEM

A. ABBREVIATIONS AND ACRONYMS:

1. **AI** – Artificial Intelligence
2. **IoT** – Internet of Things
3. **IPFS** – Interplanetary File System
4. **DNA** – Deoxyribonucleic Acid

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5. **VCF** – Variant Call Format
6. **FASTQ** – A text-based format for storing nucleotide sequences and their quality scores
7. **REST API** – Representational State Transfer Application Programming Interface
8. **MQTT** – Message Queuing Telemetry Transport
9. **HTTP/HTTPS** – Hypertext Transfer Protocol / Hypertext Transfer Protocol Secure
10. **AES** – Advanced Encryption Standard
11. **RSA** – Rivest–Shamir–Adleman (encryption algorithm)
12. **GPU** – Graphics Processing Unit
13. **ML** – Machine Learning

B. OBJECTIVE

- Predict potential genetic disease risks using AI-based analysis of patient genetic data.
- Provide personalized preventive measures, lifestyle recommendations, and early medical checkups.
- Ensure patient data privacy and security through encryption and decentralized storage (IPFS).
- Enable patients to have full control over who can access their genetic data and for what purpose.
- Implement blockchain-based consent management to maintain transparency and trust.
- Automate alerts for critical health risks and provide doctor recommendations for consultations.
- Reduce manual intervention in managing genetic data and healthcare decision-making.
- Create a cloud-based platform for real-time monitoring and remote access to health data.
- Integrate AI predictions with healthcare workflows to promote proactive healthcare.
- Support scalability and future integration with mobile applications, advanced analytics, and additional health monitoring features.
- Minimize risks of data breaches, misuse, or unauthorized access to sensitive genetic information.
- Facilitate informed decision-making for both patients and healthcare providers.

C. METHODOLOGY

The methodology of the AI-Powered Genetic Disease Risk Analyzer with Blockchain-Based Consent Management involves several key steps to ensure accurate predictions and secure data handling. First, patient genetic data is collected through DNA sequencing or uploaded in standard formats such as VCF or FASTQ, optionally combined with biometric health data. This data is then encrypted and stored securely in decentralized storage systems like IPFS to prevent unauthorized access or tampering. AI and machine learning models analyze the encrypted data to predict potential disease risks and provide personalized preventive measures, lifestyle recommendations, and early medical checkups. Simultaneously, blockchain-based smart contracts manage patient consent, controlling who can access the data, for what purpose, and for how long, with the ability to revoke access at any time. The system generates automated alerts for critical health risks and provides doctor recommendations based on predicted outcomes. Finally, a cloud-based dashboard and mobile application enable patients and healthcare providers to monitor results, access insights, and manage consultations in real-time, creating a secure, efficient, and patient-centered healthcare workflow.

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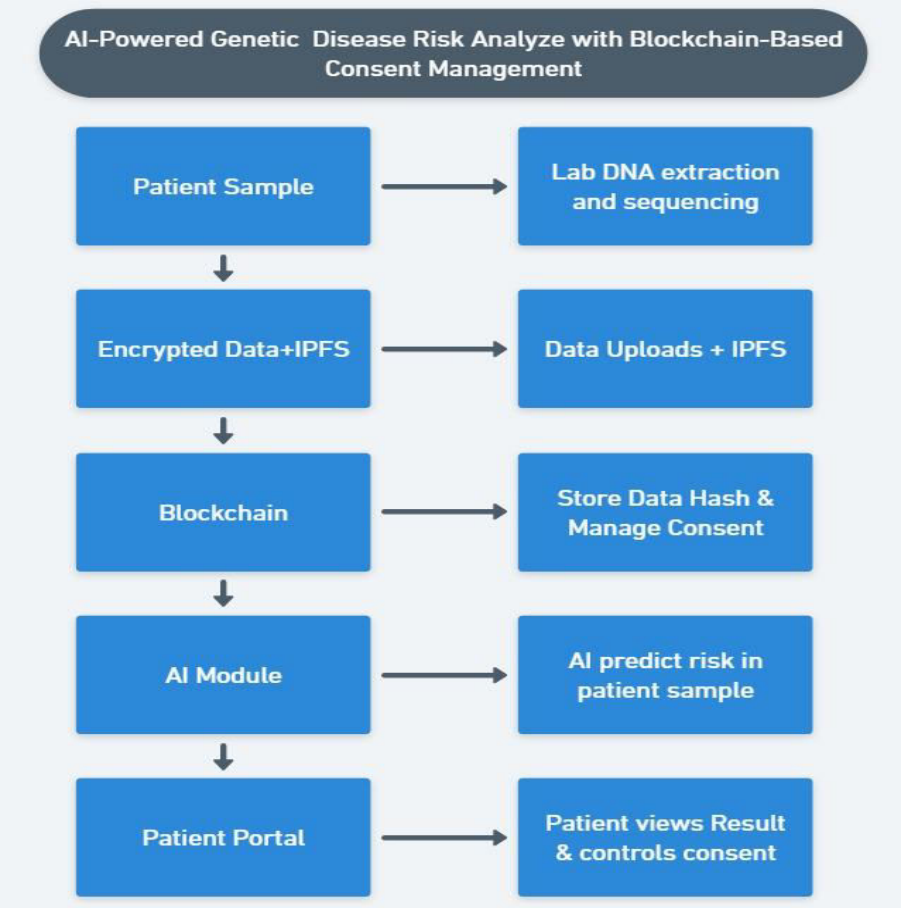

Fig 2: Flow Diagram

VI. IMPLEMENTATION OF PROJECT

The AI-Powered Genetic Disease Risk Analyzer with Blockchain-Based Consent Management is implemented through a multi-layered approach combining data collection, AI analysis, blockchain security, and user interaction. First, patient genetic data is collected through DNA sequencing or uploaded in standard formats such as VCF or FASTQ. Additional health parameters, such as heart rate, blood pressure, and glucose levels, can also be integrated to enhance predictive accuracy. The collected data is encrypted using AES/RSA encryption and stored securely in decentralized storage systems like IPFS to prevent unauthorized access or data loss.

Machine learning and AI models, implemented in Python using libraries like TensorFlow or PyTorch, analyze the encrypted data to predict genetic disease risks and generate personalized recommendations, including lifestyle changes, dietary suggestions, and early medical checkups. Blockchain smart contracts manage patient consent by recording access requests, verifying permissions, and allowing patients to revoke access at any time, ensuring transparency and security.

A cloud-based platform and mobile application provide real-time monitoring, visual dashboards, and alerts for critical health risks. The system also includes automated doctor recommendations based on AI predictions, enabling a complete healthcare workflow from prediction to consultation. Optional integration of biometric sensors allows continuous monitoring of patient health parameters, which can feed into AI models for more accurate predictions.

Finally, the system is designed to be scalable, enabling future enhancements such as mobile app integration, advanced analytics, automated preventive care alerts, and integration with hospital information systems. This comprehensive

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implementation ensures a secure, intelligent, and patient-centered healthcare solution that minimizes manual intervention and promotes proactive disease management.

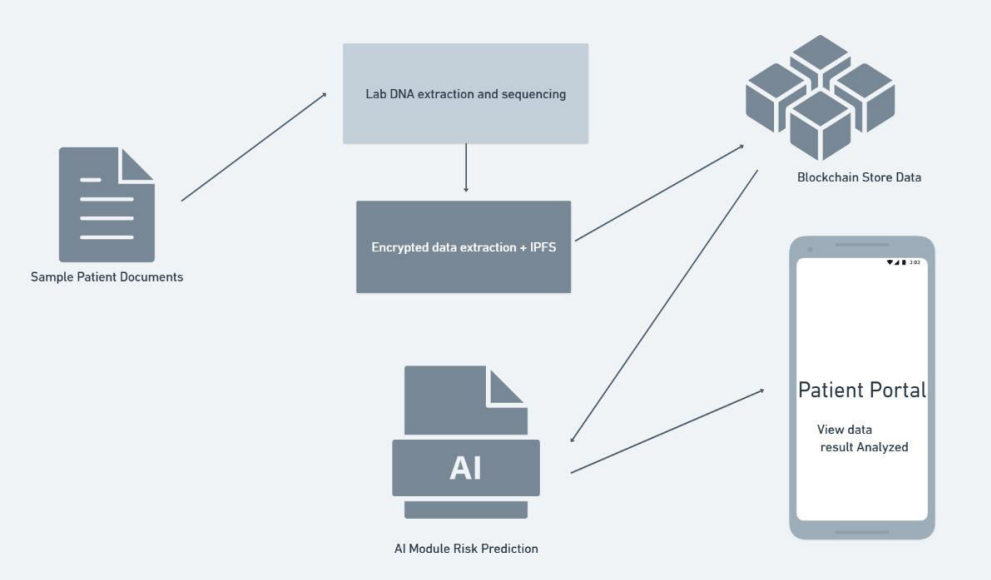

Fig 3: Architecture diagram

REAL-TIME STATISTICAL DATA:

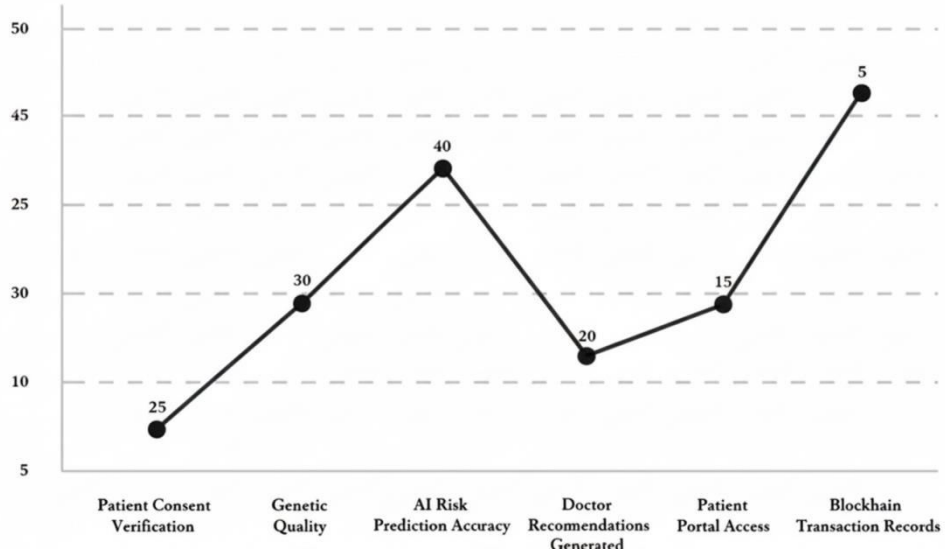

Fig 4: Use of AquaConnect System in real time

The AI-Powered Genetic Disease Risk Analyzer continuously collects, processes, and updates patient genetic and health data in real-time to provide actionable insights. The system tracks key metrics such as predicted disease risks, probability scores for different genetic disorders, and recommended preventive measures. It also monitors patient interactions, consent requests, and access history on the blockchain to ensure transparency and compliance.

Through the cloud-based dashboard or mobile application, users can view dynamic statistical data including:

- Number of patients analyzed and risk profiles generated.

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- Distribution of predicted disease risks across different genetic markers.
- Frequency and type of preventive recommendations provided.
- Real-time alerts for high-risk patients or critical health parameters.
- Doctor recommendations and follow-up actions taken based on predictions.

This real-time statistical data helps healthcare providers identify patterns, detect emerging health risks, and make data-driven decisions, while empowering patients to monitor their health proactively. The system can also generate aggregated anonymized statistics for research purposes without compromising individual privacy.

VII. ADVANTAGE

- Provides personalized disease risk predictions using AI, enabling proactive healthcare.
- Enhances data security and privacy with blockchain and decentralized storage.
- Gives patients full control over their genetic data and consent management.
- Automates alerts, recommendations, and doctor suggestions, reducing manual intervention.
- Enables real-time monitoring via cloud dashboards and mobile applications.
- Supports scalable integration of additional health parameters and AI models.
- Facilitates research with anonymized statistical data without compromising patient privacy.
- Reduces dependency on traditional, manual, and error-prone healthcare processes.
- Improves patient engagement and awareness about their own health status.
- Reduces chances of misuse or unauthorized access of sensitive genetic information.
- Integrates predictive analytics with healthcare workflows for better clinical decision-making.
- Enhances efficiency in patient-doctor consultations with AI-based recommendations.
- Minimizes healthcare costs by promoting preventive care and early interventions.

VIII. FUTURE WORK

- Integration with wearable devices and IoT sensors to provide continuous health monitoring and enhance AI prediction accuracy.
- Implementation of advanced and explainable AI models for more precise risk prediction and transparent reasoning.
- Development of a fully-featured mobile application with real-time notifications, interactive dashboards, chat support, and telemedicine integration.
- Proactive alert systems for high-risk conditions to enable early interventions and better disease management.
- Adoption of more scalable blockchain frameworks to handle larger datasets, multiple concurrent transactions, and faster consensus.
- Anonymized data-sharing capabilities for population-level studies, drug development, and personalized medicine research.
- AI-driven personalized health plans based on genetic predisposition, lifestyle, and real-time monitoring for preventive care.
- Integration with public health systems to support disease surveillance, early detection, and implementation of preventive strategies.
- Continuous improvement of user experience and accessibility, including multilingual support and intuitive interfaces.
- Incorporation of predictive analytics for environmental and lifestyle factors to enhance holistic health recommendations.

REFERENCES

[1] M. Shukla, S. Trivedi, Recent advances in AI for personalized medicine and predictive analytics, Journal of Medical Systems, vol. 45, no. 8, 2021, pp. 1–12.
[2] S. Rajkumar, J. Dean, I. Kahane, Machine learning in medicine, New England Journal of Medicine, vol. 380, 2019, pp. 1347–1358.
[3] S. Nakamoto, Bitcoin: A peer-to-peer electronic cash system, 2008.

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(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

[4] V. Buterin, Ethereum White Paper: A Next-Generation Smart Contract and Decentralized Application Platform, 2013.
[5] J. Benet, IPFS - Content Addressed, Versioned, P2P File System, arXiv preprint arXiv:1407.3561, 2014.
[6] A. D. Gupta, P. Kumar, Blockchain-based secure healthcare data management: A review, International Journal of Medical Informatics, vol. 150, 2021, 104457.
[7] R. G. Sharma, S. Verma, AI and blockchain integration for healthcare: Trends and challenges, Computers in Biology and Medicine, vol. 144, 2022, 105331.
[8] M. Al-Kahtani, F. Alotaibi, Privacy-preserving healthcare data sharing using blockchain, IEEE Access, vol. 9, 2021, pp. 12345–12356.
[9] T. Nguyen, P. Tran, A survey on AI applications in genomic data analysis, Bioinformatics Advances, vol. 2, no. 1, 2022.
[10] K. Lee, H. Kim, Cloud-based healthcare platforms integrating AI and blockchain for personalized medicine, Journal of Biomedical Informatics, vol. 115, 2021, 103688.

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