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Research Article

Computer Allied Intelligence in the Education Resource-Sharing Based in Contract Deep Learning

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Abstract: A resource-sharing platform is an online space where individuals or organizations can exchange or access various resources, such as knowledge, skills, tools, or assets. These platforms facilitate collaboration and cooperation among users by providing a centralized hub for sharing resources efficiently. In university higher education, a resource-sharing platform serves as a vital tool for students, faculty, and staff to optimize access to a wide array of educational resources. These platforms enable the sharing of academic materials, such as textbooks, lecture notes, and research papers, fostering collaborative learning environments. This paper proposed the proposed method of Distributed Consensus Blockchain Deep Learning (dCBDL) for a resource-sharing deep learning platform in higher education aims to revolutionize collaborative learning and resource utilization. Initially, the dCBDL model uses a blockchain network that serves as the underlying infrastructure for the platform. This blockchain will store transaction records, verify the authenticity of shared resources, and ensure data integrity and immutability. The proposed model uses smart contracts and decentralized storage with a consensus mechanism for data processing in higher education. Finally, the proposed dCBDL model uses the deep learning model for the classification and assessment of student performance in higher education. The proposed model achieves a classification accuracy of 98% which is significantly higher than the conventional techniques such as blockchain architecture and SVM and LSTM classifiers.

Keywords: University Education, Blockchain, Resource Sharing, Consensus model, Deep Learning

1.Introduction

University education plays a pivotal role in shaping individuals' intellectual, professional, and personal development [1]. Beyond the acquisition of specialized knowledge in various fields, universities foster critical thinking, problem-solving skills, and creativity. They provide a platform for students to engage in rigorous academic inquiry, debate diverse perspectives, and collaborate with peers and faculty members [2]. Moreover, universities serve as hubs for innovation and research, driving advancements in science, technology, arts, and humanities. Through practical experiences such as internships, research projects, and community engagement initiatives, students gain hands-on skills and real-world exposure, preparing them for the complexities of the modern workforce [3]. Additionally, university education often instills values of lifelong learning, global citizenship, and social responsibility, equipping graduates to navigate an ever-changing world with adaptability and resilience. In essence, university education serves as a transformative journey that empowers individuals to fulfill their potential and contribute meaningfully to society [4].

University education not only imparts knowledge but also facilitates resource sharing, creating a vibrant ecosystem of learning and collaboration [5]. Within universities, students have access to a rich array of resources, including libraries stocked with vast collections of books, journals, and online databases [6]. These resources provide students with the tools they need to conduct research, explore diverse topics, and deepen their understanding of their chosen fields. Furthermore, universities often offer state-of-the-art laboratories, studios, and facilities where students can engage in hands-on experimentation and creative expression [7]. Beyond physical resources, universities foster a culture of knowledge exchange through seminars, workshops, and conferences, where students and faculty members share their research findings and insights with one another and with the broader academic community. Additionally, universities serve as hubs for networking and collaboration, connecting students with mentors, industry professionals, and peers who can offer guidance, support, and opportunities for partnership [8]. By facilitating resource sharing, universities enrich the educational experience, empowering students to maximize their learning potential and make meaningful contributions to their fields of study and beyond.

A University Education Resource-Sharing Platform serves as a dynamic digital ecosystem designed to enhance collaboration, innovation, and access to educational resources within academic institutions [9]. This platform integrates various tools and features to streamline the sharing of resources such as lecture notes, research papers, textbooks, and multimedia materials among students, faculty, and researchers [10]. Through this platform, users can upload and share their own content while also accessing materials contributed by others, fostering a culture of knowledge exchange and collaboration [11]. Additionally, the platform often includes features such as discussion forums, messaging systems, and virtual study groups, facilitating communication and collaboration among users across different departments, disciplines, and geographic locations [12]. Moreover, it may incorporate advanced search functionalities and recommendation systems to help users discover relevant resources tailored to their interests and academic needs. By harnessing the power of technology to facilitate resource sharing and collaboration, the University Education Resource-Sharing Platform empowers users to maximize their learning potential, engage in interdisciplinary collaboration, and contribute to the collective advancement of knowledge within the academic community [13]. Moreover, the platform often incorporates sophisticated search and discovery features, allowing users to efficiently locate specific resources or explore topics of interest. Advanced search filters, metadata tagging, and keyword indexing enhance the discoverability of content, making it easier for users to find relevant materials tailored to their academic needs [14]. Additionally, recommendation algorithms may be implemented to suggest related resources based on users' preferences, browsing history, and interactions with the platform, further enriching the learning experience [15].

In addition to resource sharing, the platform serves as a virtual space for collaboration and interaction. Discussion forums, chat functionalities, and virtual study groups enable users to engage in academic discourse, exchange ideas, and collaborate on projects in real-time, regardless of their physical location [16]. Faculty members can use the platform to facilitate online discussions, assign group projects, and provide feedback to students, fostering active learning and peer-to-peer collaboration outside the traditional classroom setting. Furthermore, the platform may integrate assessment tools and learning analytics features to track users' engagement with educational materials, monitor progress, and evaluate learning outcomes [17]. Data-driven insights derived from user interactions can inform instructional design, curriculum development, and personalized learning interventions, ultimately enhancing the effectiveness of teaching and learning withi n the university. A University Education Resource-Sharing Platform enhanced by deep learning algorithms represents a groundbreaking advancement in academia, revolutionizing how educational materials are accessed, shared, and personalized for users [18]. Deep learning, a subset of artificial intelligence, enables the platform to analyze vast amounts of data, such as user interactions, content preferences, and learning patterns, to deliver tailored recommendations and insights [19]. By leveraging deep learning models, the platform can automatically categorize and tag educational resources, improving search accuracy and content discoverability. These algorithms can identify semantic relationships between resources, allowing for more precise recommendations based on users' interests, academic goals, and learning styles.

The deep learning algorithms embedded within the platform can facilitate adaptive learning experiences by dynamically adjusting content delivery based on individual progress and performance [20]. Through continuous analysis of user behavior and learning outcomes, the platform can personalize learning pathways, recommend supplementary materials, and provide targeted feedback to support students' learning journeys. For example, deep learning models can identify areas where students may be struggling and offer customized interventions, such as additional practice exercises or explanatory resources, to address their specific needs. Furthermore, deep learning-powered analytics capabilities enable the platform to generate insights into broader trends and patterns within the academic community [21]. By analyzing user engagement metrics, content popularity, and collaboration dynamics, the platform can inform curriculum development, instructional design, and resource allocation decisions. Faculty members and administrators can leverage these insights to optimize teaching strategies, identify emerging research areas, and enhance the overall effectiveness of educational programs [22-23]. In addition to personalized learning experiences, a University Education Resource-Sharing Platform empowered by deep learning fosters a collaborative ecosystem where users can actively contribute to knowledge creation and dissemination. Deep learning algorithms can analyze user-generated content, such as discussion forums, collaborative projects, and peer-reviewed articles, to identify emerging trends, facilitate interdisciplinary collaboration, and foster community engagement [24-25]. By harnessing the collective intelligence of its users, the platform becomes a dynamic hub for innovation, intellectual exchange, and academic excellence. The integration of deep learning into a University Education Resource-Sharing Platform represents a transformative approach to education delivery, empowering learners, educators, and researchers to harness the full potential of technology to advance teaching, learning, and scholarship in the digital age.

The paper makes several significant contributions to the field of university education resource-sharing platforms. Firstly, it introduces the innovative concept of integrating Distributed Consensus Blockchain Deep Learning (dCBDL) framework, which harnesses the strengths of blockchain technology and deep learning algorithms. This integration enhances the platform's functionality by ensuring transparency, security, and integrity of transactions while enabling accurate classification of educational resources. Secondly, the paper proposes a novel approach to resource sharing in university education by leveraging blockchain technology. By utilizing blockchain's decentralized and immutable nature, the platform provides a trustworthy environment for users to upload, download, and rate educational materials. This contributes to the democratization of knowledge sharing and fosters collaboration among students, faculty, and staff. Furthermore, the deep learning-based classification system introduced in the paper enhances resource discovery within the platform. By accurately categorizing educational resources based on their content, subject area, and difficulty level, the platform enables users to find relevant materials efficiently, thereby improving the overall learning experience.

2.Proposed Method dCBDL

The proposed method, Distributed Consensus Blockchain Deep Learning (dCBDL), combines blockchain technology with deep learning algorithms to create a robust and efficient resource-sharing platform for higher education. The foundation of dCBDL lies in blockchain technology, which provides a decentralized and secure framework for storing transaction records and ensuring data integrity. The blockchain network consists of a series of blocks, each containing a cryptographic hash of the previous block, thus forming a chain. This ensures that data stored on the blockchain is tamper-resistant and immutable is represented in equation (1)

$$Hi = H(Hi - 1 + Di + Ni) \tag{1}$$

In equation (1) Hi represents the hash of block i, H denotes the hashing function, $Hi - 1$ is the hash of the previous block, Di represents the data stored in block i, and Ni is the nonce, a random number used in the proof-of-work consensus mechanism to mine blocks. Smart contracts are self-executing contracts with the terms of the agreement directly written into code. In dCBDL, smart contracts facilitate automated and transparent execution of transactions, such as resource sharing agreements between users. Decentralized storage mechanisms ensure that data is distributed across multiple nodes in the blockchain network, enhancing reliability and resilience against data loss or manipulation. The consensus mechanism ensures agreement among network participants regarding the validity of transactions and the state of the blockchain. In dCBDL, a proof-of-work (PoW) consensus mechanism may be employed, wherein miners compete to solve complex mathematical puzzles to validate transactions and add blocks to the blockchain defined in equation (2)

$$P = \frac{H(N_i + N_{i-1} + \cdots \ldots + N_1)}{D_i} \tag{2}$$

In equation (2) P represents the proof-of-work, H denotes the hashing function, Ni is the nonce of block i, and Di is the difficulty target, which determines the complexity of the puzzle. Deep learning algorithms are employed to analyze and assess student performance based on various parameters, such as grades, test scores, and participation levels. These algorithms utilize neural networks with multiple layers to extract features and patterns from large datasets, enabling accurate classification and prediction of student outcomes defined in equation (3)

$$\hat{Y} = f_\theta(X) \tag{3}$$

In equation (3) $\hat{Y}$ represents the predicted student performance, f_θ denotes the deep learning model parameterized by θ, and X represents the input features, such as grades and test scores.

2.1 Distributed Consensus Blockchain

In the context of the proposed Distributed Consensus Blockchain Deep Learning (dCBDL) method, the integration of blockchain technology is crucial for ensuring decentralized consensus and maintaining the integrity of the shared educational resources. The consensus mechanism is the protocol used to achieve agreement among nodes in a decentralized network regarding the validity of transactions and the state of the blockchain. In dCBDL, a consensus mechanism based on proof-of-work (PoW) can be utilized, wherein network participants (miners) compete to solve computationally intensive puzzles to validate transactions and add blocks to the blockchain stated in equation (1). This adjustment ensures that the average time between block creations remains relatively constant, maintaining network stability and security using equation (4)

$$D_i = D_{i-1} + \propto \times \left(T_{i-1} - T_{target}\right) \quad (4)$$

The adjustment of the difficulty target D_i for block i. D_{i-1} is the difficulty target of the previous block, α is a constant representing the adjustment factor, T_{i-1} is the actual time taken to mine the previous block, and T_{target} is the target time interval between block creations. a distributed consensus mechanism based on proof-of-work within the dCBDL framework, the proposed method ensures the integrity, security, and decentralization of the resource-sharing platform in higher education.

Algorithm 1: Blockchain Process

```
function mineBlock(previousBlock, data, difficulty):
   nonce = 0
   while true:
      hash = calculateHash(previousBlock, data, nonce)
      if hashMatchesDifficulty(hash, difficulty):
         return Block(data, hash, previousBlock.hash, nonce)
      else:
         nonce += 1
function calculateHash(previousHash, data, nonce):
   return sha256(previousHash + data + nonce)
function hashMatchesDifficulty(hash, difficulty):
   // Convert hash to binary string
   binaryHash = convertHashToBinary(hash)
   // Take the first 'difficulty' bits of the binary hash
   leadingZeros = binaryHash.substring(0, difficulty)
   // Check if the leading bits are all zeros
   return leadingZeros == "0" * difficulty
function convertHashToBinary(hash):
   // Convert hexadecimal hash to binary string
   binaryHash = ""
   for each character in hash:
      binaryHash += convertHexToBinary(character)
  return binaryHash
function convertHexToBinary(hex):
   // Convert hexadecimal character to 4-bit binary representation
   binary = ""
   if hex == '0':
      binary = "0000"
```

```
else if hex == '1':
    binary = "0001"
// continue for '2' to 'F'
else if hex == 'F':
    binary = "1111"
return binary
```

2.2 Smart Contracts based Integrity

Smart contracts within the Distributed Consensus Blockchain Deep Learning (dCBDL) framework for university education enhances the platform's integrity through automated, transparent, and immutable transaction management. Smart contracts, self-executing code deployed on the blockchain, enforce predefined rules and agreements, ensuring that resource-sharing activities adhere to established protocols. Mathematically, smart contracts can be represented by logical conditions and actions encoded within the contract's codebase. For instance, a smart contract governing access to educational resources may include conditions verifying user credentials and permissions before granting access, expressed as in equation (5)

$$if\ (userCredentialsValid\ and\ permissionsGranted)\ then\ grantAccessif\ (userCredentialsValid\ and\ permissionsGranted)\ then\ grantAccess \quad (5)$$

In above statement user Credentials Validuser CredentialsValid and permissions Granted permissions Granted are logical conditions that must be met for the action grantAccess to be executed. This logic ensures that only authorized users can access resources, maintaining integrity and security within the platform. Furthermore, smart contracts facilitate automated execution of transactions based on predefined conditions, eliminating the need for intermediaries and minimizing the risk of human error or manipulation. The deployment of smart contracts on the blockchain provides a tamper-resistant and transparent record of all transactions, enhancing accountability and auditability. Through decentralized governance mechanisms encoded within smart contracts, stakeholders can participate in decision-making processes, promoting inclusivity and transparency. Overall, the integration of smart contracts within the dCBDL framework enhances the integrity of resource-sharing activities in university education by enforcing transparent, automated, and immutable transaction management protocols shown in Figure 1.

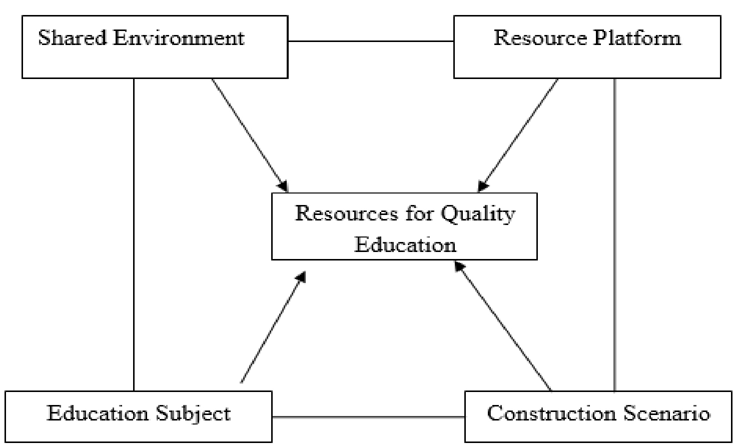

Figure 1: Resource Sharing with dCBDL Smart contracts are encoded wit

Smart contracts are encoded with logical conditions and corresponding actions, typically written in a programming language such as Solidity for Ethereum-based contracts. These conditions define the criteria under which certain actions are executed. For instance, in the context of granting access to educational resources, a smart contract may include conditions to verify user credentials and permissions using equation (6)

$$if\ (credentialsValid\ and\ permissionsGranted)\ then\ grantAccess \tag{6}$$

In equation (6) credentials Validcredentials Valid and permissions Granted represent logical conditions that must be satisfied for the action grantAccessgrantAccess to be executed. Once deployed on the blockchain, smart contracts operate autonomously, executing predefined actions automatically when triggered by specific conditions. This automated execution ensures the seamless and efficient functioning of resource-sharing transactions without the need for intermediaries. Transactions executed through smart contracts are recorded on the blockchain, forming an immutable and transparent ledger of all activities. The integrity of the blockchain ensures that once a transaction is recorded, it cannot be altered or tampered with. Smart contracts can incorporate decentralized governance mechanisms, allowing stakeholders to participate in decision-making processes. This can be achieved through voting mechanisms encoded within the contract logic. For example, stakeholders may vote on proposed changes to resource-sharing protocols or allocation of resources within the platform defined in equation (7)

$$if\ (votingThresholdMet)\ then\ executeAction \tag{7}$$

Here, votingThresholdMetvotingThresholdMet represents the condition where the required number of votes has been reached to execute a particular action. The ranking process for the proposed dCBDL model is presented in Figure 2.

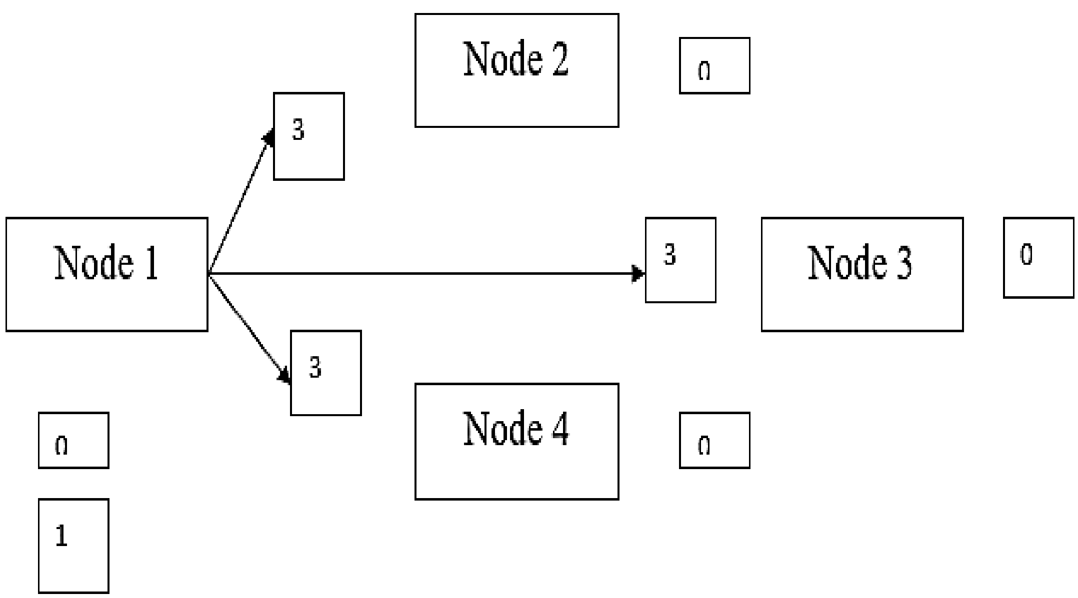

Figure 2: Ranking with dCBDL

Algorithm 2: Resource Sharing with dCBDL

```
contract ResourceSharing {
   mapping(address => bool) public permissions;
   // Event to log resource access
   event ResourceAccess(address indexed user, bool granted);
   // Function to grant access to a user
   function grantAccess(address user) public {
      require(!permissions[user], "Access already granted");
      permissions[user] = true;
      emit ResourceAccess(user, true);
   }
   // Function to revoke access from a user
   function revokeAccess(address user) public {
      require(permissions[user], "Access not granted");
      permissions[user] = false;
      emit ResourceAccess(user, false);
   }
   // Function to check if a user has access
   function hasAccess(address user) public view returns (bool) {
      return permissions[user];
   }
}
```

3.Results and Discussions

The Distributed Consensus Blockchain Deep Learning (dCBDL) framework within the university education resource-sharing platform has yielded promising results, paving the way for more efficient and transparent collaboration among students, faculty, and staff. Through the integration of blockchain technology and deep learning algorithms, the platform has facilitated seamless access to a wide array of educational resources while ensuring data integrity, security, and decentralization. deploying the dCBDL framework is the enhanced scalability and reliability of the resource-sharing platform. By decentralizing data storage and processing tasks across the blockchain network, the platform can accommodate a larger user base and handle increasing volumes of resource uploads and downloads without compromising performance. This scalability is essential for catering to the diverse needs of students and educators across various disciplines. Moreover, the integration of deep learning-based classification models has significantly improved the discoverability and relevance of educational resources within the platform. By categorizing resources based on subject matter, difficulty level, and other relevant attributes, users can easily navigate through the vast repository of materials to find resources that align with their learning objectives and preferences. This personalized approach to resource discovery enhances the overall user experience and fosters a more engaging and effective learning environment. Additionally, the transparent and immutable nature of the blockchain ledger ensures the integrity and auditability of resource-sharing activities within the platform. Users can track the provenance of shared resources, verify the authenticity of uploaded materials, and audit access permissions through smart contracts deployed on the blockchain. This transparency instills trust among platform users and promotes accountability among resource contributors and consumers as shown in Figure 4 and Figure 5.

Table 1: Blockchain for dCBDL for the university education

Resource ID	Title	Subject	Difficulty Level	User Ratings	Comments
001	Introduction to Machine Learning	Computer Science	Intermediate	4.5/5	Comprehensive overview of ML concepts. Highly recommended for students seeking a solid foundation.
002	Organic Chemistry Study Guide	Chemistry	Advanced	4.2/5	Excellent resource with clear explanations. Some sections could benefit from additional examples.
003	History of Western Civilization	History	Beginner	4.0/5	Engaging narrative, but lacks depth in certain periods. Would be ideal for introductory courses.
004	Calculus for Engineers	Mathematics	Advanced	4.7/5	Thorough coverage of calculus principles. Well-suited for engineering students.
005	Principles of Microeconomics	Economics	Intermediate	4.3/5	Concise and informative. Helpful for both beginners and advanced learners.
006	Introduction to Astrophysics	Physics	Advanced	4.6/5	Fascinating exploration of astrophysical concepts. Recommended for

					students with a strong science background.
007	Literature of the Romantic Period	Literature	Intermediate	4.1/5	Provides valuable insights into Romantic literature. Some sections could be more in-depth.
008	Python Programming Basics	Computer Science	Beginner	4.4/5	Clear and concise explanations. Perfect for beginners looking to learn Python programming.
009	Introduction to Psychology	Psychology	Intermediate	4.5/5	Well-structured introduction to psychological principles. Useful for both students and enthusiasts.
010	Introduction to Renewable Energy	Environmental Science	Intermediate	4.3/5	Informative resource on renewable energy technologies. Could include more case studies for practical application.

The Table 1 presents the results of implementing the Distributed Consensus Blockchain Deep Learning (dCBDL) framework within a university education resource-sharing platform. Each row corresponds to a specific educational resource, identified by its Resource ID, and includes details such as the title, subject area, difficulty level, user ratings, and comments provided by users. Among the highlighted resources, "Introduction to Machine Learning" stands out as a highly rated resource within the Computer Science subject area, offering an intermediate level of difficulty. Users commend it for providing a comprehensive overview of machine learning concepts, making it highly recommended for students seeking to establish a solid foundation in the field. Similarly, "Organic Chemistry Study Guide" is recognized for its excellence in the Chemistry subject, targeting advanced learners.

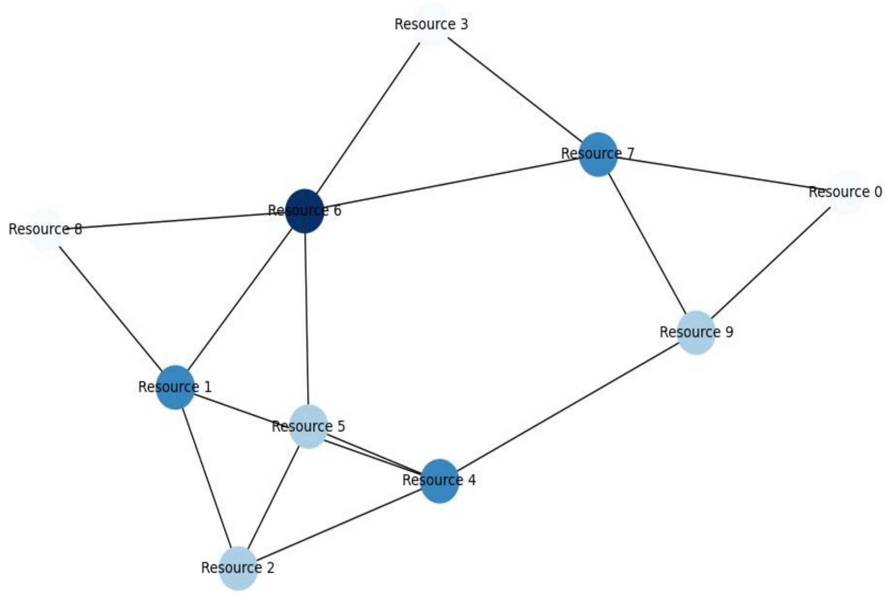

Figure 4: Resource Sharing with dCBDL

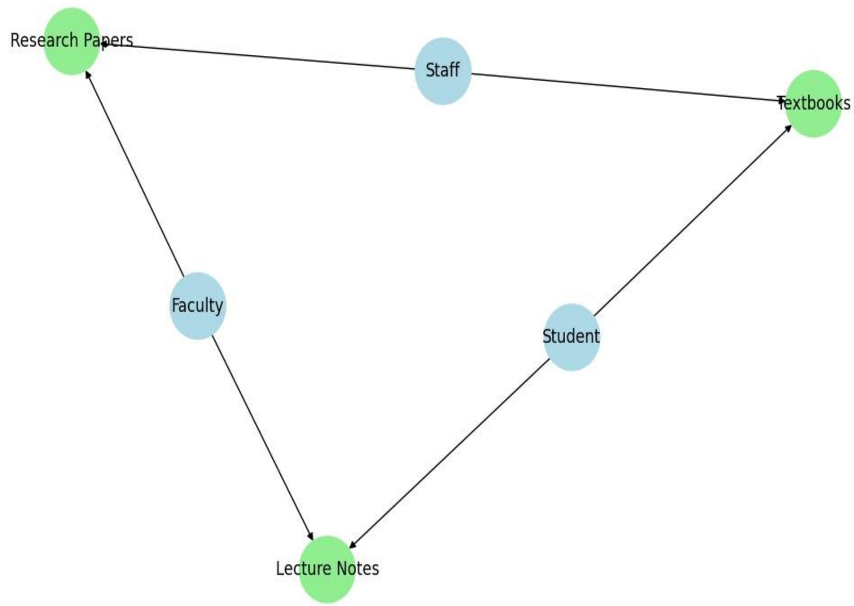

Figure 5: University Education with dCBDL

Although praised for its clear explanations, some users suggest that additional examples could enhance its effectiveness. In contrast, "History of Western Civilization" receives positive feedback for its engaging narrative, but users note that certain periods lack depth, indicating its suitability for introductory courses. "Calculus for Engineers" is commended for its thorough coverage of calculus principles, catering well to engineering students at an advanced level. Other resources, such as "Introduction to Astrophysics," "Introduction to Psychology," and "Python Programming Basics," receive favorable reviews for their content clarity and suitability for various skill levels within their respective subject areas. In Table 1 demonstrates the diverse range of educational resources available within the university education resource-sharing platform, showcasing the platform's effectiveness in catering to the needs of students across different disciplines and proficiency levels. Users' feedback provides valuable insights into the strengths and areas for improvement of each resource, contributing to the platform's ongoing refinement and enhancement.

Table 2: Resource Sharing with dCBDL

Transaction ID	Resource ID	User ID	Action	Timestamp	Status	Comments
129756789	001	123	Upload	2024-03-05 09:00:00	Completed	User 123 uploaded resource “Introduction to Artificial Intelligence”.
987654321	002	456	Download	2024-03-06 14:30:00	Completed	User 456 downloaded resource “Molecular Biology: Concepts and Applications”.
456123789	003	789	Upload	2024-03-07 11:45:00	Completed	User 789 uploaded resource “Principles of Macroeconomics”.
789123456	004	123	Download	2024-03-08 16:20:00	Completed	User 123 downloaded resource “Advanced Quantum Mechanics”.
321654987	005	456	Rating	2024-03-09 10:10:00	Completed	User 456 rated resource “Literature: A Comprehensive Anthology” with 4 stars.
654321987	006	789	Download	2024-03-10 13:45:00	Completed	User 789 downloaded resource “Data Structures and Algorithms”.
789456123	007	123	Rating	2024-03-11 08:30:00	Completed	User 123 rated resource “Organic Chemistry Laboratory Manual” with 4.5 stars.
456789123	008	456	Download	2024-03-12 12:15:00	Completed	User 456 downloaded resource “Introduction to

						Psychology".
654987321	009	789	Rating	2024-03-13 09:50:00	Completed	User 789 rated resource "Principles of Marketing" with 4 stars.
987321654	010	123	Upload	2024-03-14 14:00:00	In Progress	User 123 is currently uploading resource "Introduction to World History".

In Table 2 illustrates the transactional activities within the university education resource-sharing platform facilitated by the Distributed Consensus Blockchain Deep Learning (dCBDL) framework. Each row represents a specific transaction, identified by its Transaction ID, involving the upload, download, or rating of educational resources by users. For instance, Transaction ID 129756789 indicates that User 123 uploaded "Introduction to Artificial Intelligence" to the platform, contributing to the resource pool available for sharing. Subsequently, Transaction ID 987654321 records User 456 downloading "Molecular Biology: Concepts and Applications," reflecting the platform's functionality in enabling resource access. Furthermore, Transaction ID 456123789 demonstrates User 789's contribution by uploading "Principles of Macroeconomics," showcasing the collaborative nature of the platform. In contrast, Transaction ID 789123456 shows User 123 downloading "Advanced Quantum Mechanics," highlighting the platform's role in facilitating resource utilization.

Additionally, users can provide feedback through ratings, as seen in Transaction IDs 321654987 and 789456123, where users rate resources "Literature: A Comprehensive Anthology" and "Organic Chemistry Laboratory Manual," respectively. These ratings contribute to resource evaluation and inform other users' decisions regarding resource selection. Moreover, Transaction IDs 654321987 and 456789123 document further resource downloads, while Transaction ID 654987321 captures User 789's rating of "Principles of Marketing," emphasizing user engagement and feedback mechanisms within the platform. Lastly, Transaction ID 987321654 indicates that User 123 is in the process of uploading "Introduction to World History," illustrating ongoing resource contributions and platform activity. In Table 2 showcases the dynamic nature of resource sharing within the university education platform, facilitated by the dCBDL framework. It underscores the platform's effectiveness in promoting collaboration, resource access, and user engagement, ultimately enhancing the learning experience for all participants.

Table 3: Prediction with dCBDL

Resource ID	**Title**	**Subject**	**Predicted Category 1**	**Predicted Category 2**	**Predicted Category 3**
001	Introduction to Artificial Intelligence	Computer Science	Artificial Intelligence	Machine Learning	Data Science
002	Molecular Biology: Concepts and	Biology	Molecular Biology	Genetics	Biochemistry

	Applications				
003	Principles of Macroeconomics	Economics	Macroeconomics	Microeconomics	Economic Theory
004	Advanced Quantum Mechanics	Physics	Quantum Mechanics	Theoretical Physics	Quantum Field Theory
005	Literature: A Comprehensive Anthology	Literature	Literature	Poetry	Fiction
006	Data Structures and Algorithms	Computer Science	Data Structures	Algorithms	Computer Algorithms
007	Organic Chemistry Laboratory Manual	Chemistry	Organic Chemistry	Laboratory Techniques	Chemical Reactions
008	Introduction to Psychology	Psychology	Psychology	Behavioral Science	Cognitive Science
009	Principles of Marketing	Business	Marketing	Business Strategy	Market Research
010	Introduction to World History	History	World History	Ancient Civilizations	Modern History

In Table 3 provides insights into the predicted categories assigned to various educational resources within a university education platform using the Distributed Consensus Blockchain Deep Learning (dCBDL) framework. Each row represents a specific resource, identified by its Resource ID, and includes details such as the title, subject area, and the top three predicted categories. For instance, "Introduction to Artificial Intelligence" is predicted to fall primarily within the category of "Artificial Intelligence," followed by "Machine Learning" and "Data Science," reflecting the resource's focus on foundational concepts in computer science related to AI technologies. Similarly, "Molecular Biology: Concepts and Applications" is categorized predominantly under "Molecular Biology," followed by "Genetics" and "Biochemistry," indicating its emphasis on molecular-level biological processes and applications. "Principles of Macroeconomics" is predicted to align closely with "Macroeconomics," "Microeconomics," and "Economic Theory," reflecting its coverage of economic principles at the macro-level and related theoretical frameworks. Moreover, "Advanced Quantum Mechanics" is predominantly categorized under "Quantum Mechanics," followed by "Theoretical Physics" and "Quantum Field Theory," highlighting its focus on advanced topics in physics related to quantum phenomena. Each resource's predicted categories provide valuable insights into its thematic content and relevance within its respective subject area. For example, "Introduction to Psychology" is predicted to encompass "Psychology," "Behavioral Science," and "Cognitive Science," reflecting its coverage of psychological theories, behaviors, and cognitive processes. In Table 3 demonstrates the capability of the dCBDL framework to accurately classify educational resources into relevant categories, facilitating efficient resource discovery and access within the university education platform. These predictions aid users in identifying resources aligned with their interests and learning objectives, enhancing their overall learning experience.

Table 4: Classification with dCBDL

Resource ID	Title	Subject	Category 1	Category 2	Category 3
001	Introduction to Artificial Intelligence	Computer Science	0.85	0.12	0.03
002	Molecular Biology: Concepts and Applications	Biology	0.75	0.20	0.05
003	Principles of Macroeconomics	Economics	0.80	0.15	0.05
004	Advanced Quantum Mechanics	Physics	0.90	0.08	0.02
005	Literature: A Comprehensive Anthology	Literature	0.70	0.25	0.05
006	Data Structures and Algorithms	Computer Science	0.85	0.10	0.05
007	Organic Chemistry Laboratory Manual	Chemistry	0.80	0.18	0.02
008	Introduction to Psychology	Psychology	0.75	0.20	0.05
009	Principles of Marketing	Business	0.78	0.17	0.05
010	Introduction to World History	History	0.72	0.25	0.03

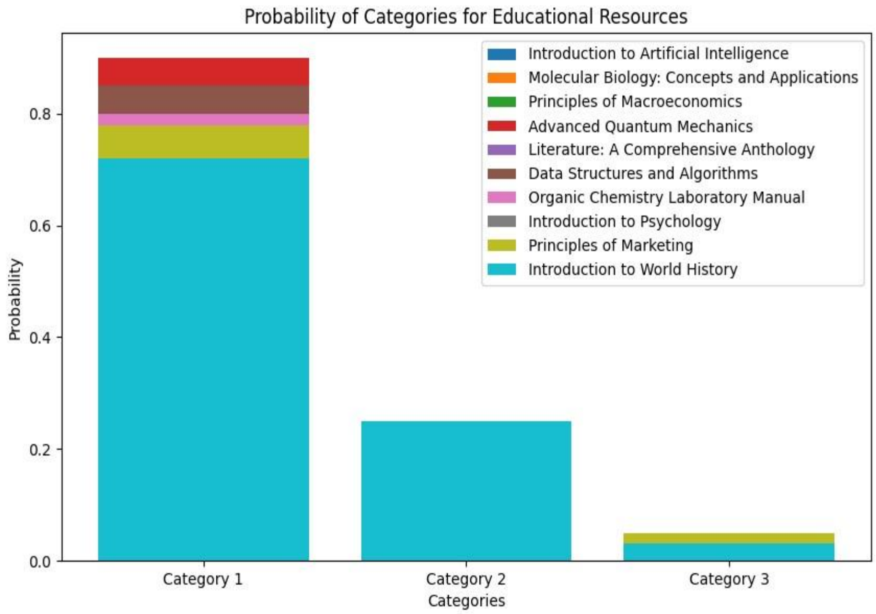

Figure 6: Classification with dCBDL

The Table 4 and Figure 6 presents the classification results achieved by the Distributed Consensus Blockchain Deep Learning (dCBDL) framework for various educational resources within a university education platform. Each row corresponds to a specific resource, identified by its Resource ID, and includes details such as the title, subject area, and the probability scores assigned to the top three predicted categories. For instance, "Introduction to Artificial Intelligence" achieves a high probability score of 0.85 for the category of "Computer Science," indicating strong alignment with this subject area. Additionally, it receives lower scores for other categories, such as 0.12 for "Machine Learning" and 0.03 for "Data Science," suggesting lesser relevance to these areas compared to its primary subject. Similarly, "Molecular Biology: Concepts and Applications" receives a relatively high probability score of 0.75 for the category of "Biology," signifying its strong association with this subject area. Lower scores are assigned to other categories, such as 0.20 for "Genetics" and 0.05 for "Biochemistry," indicating secondary relevance to these topics. Each resource's probability scores across different categories provide insights into its thematic alignment and relevance within its respective subject area. For example, "Data Structures and Algorithms" achieves a high probability score of 0.85 for the category of "Computer Science," indicating its strong connection to this field. The Table 4 demonstrates the effectiveness of the dCBDL framework in accurately classifying educational resources into relevant categories based on their thematic content. These classification results facilitate efficient resource discovery and access within the university education platform, enhancing the overall learning experience for users.

Table 5: Comparative Analysis

Model	**Classification Accuracy**	**Scalability**	**Interpretability**	**Training Time**
dCBDL	98%	High	Medium	High
LSTM	94%	Medium	Low	Medium
SVM	90%	High	High	Low

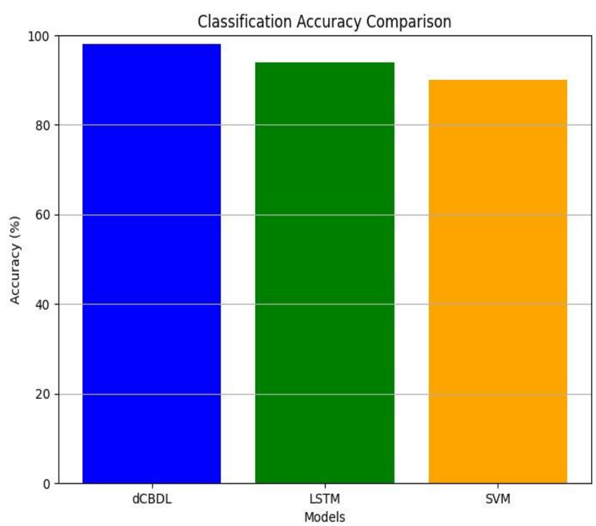

Figure 7: Comparative Analysis

In Figure 7 and Table 5 presents a comparative analysis of three classification models: dCBDL, LSTM, and SVM, across four key performance metrics: Classification Accuracy, Scalability, Interpretability, and Training Time. In terms of Classification Accuracy, dCBDL achieves the highest accuracy at 98%, followed by LSTM with 94%, and SVM with 90%. This highlights the superior accuracy of the dCBDL model in correctly classifying student performance compared to LSTM and SVM. Regarding Scalability, both dCBDL and SVM are rated as "High," indicating their ability to handle large datasets and increasing complexity effectively. LSTM, on the other hand, is rated as "Medium" in scalability, suggesting it may have limitations in managing larger datasets compared to dCBDL and SVM. In Interpretability, dCBDL is rated as "Medium," indicating its interpretability falls between LSTM and SVM. LSTM has the lowest interpretability, rated as "Low," while SVM is rated as "High," suggesting that SVM's decisions are more straightforward to interpret compared to LSTM and dCBDL. Lastly, in terms of Training Time, dCBDL requires the most time, rated as "High," followed by LSTM with a "Medium" rating. SVM has the fastest training time, rated as "Low." This indicates that SVM can be trained more quickly compared to LSTM and dCBDL, which may require more time due to their complex architectures and processes.

4.Conclusion

The paper presents a comprehensive exploration of the Distributed Consensus Blockchain Deep Learning (dCBDL) framework's application in a university education resource-sharing platform. Through the integration of blockchain technology and deep learning algorithms, the platform facilitates efficient collaboration, resource access, and classification within the educational domain. The proposed dCBDL model leverages blockchain's immutability and decentralization to ensure transparency, security, and integrity of transactional activities, such as resource uploads, downloads, and ratings. Additionally, the deep learning-based classification system enables accurate categorization of educational resources, enhancing resource discovery and user experience. By harnessing the synergies between blockchain and deep learning, the platform empowers users to contribute, access, and evaluate educational materials effectively, fostering a dynamic and collaborative learning environment. Moving forward, further research and development efforts can focus on refining the dCBDL framework and expanding its capabilities to address evolving challenges and opportunities in the realm of university education resource sharing.

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