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INNOVATIVE INTEGRATION OF COMPUTER NETWORK TECHNOLOGY IN MODERN EDUCATIONAL SYSTEMS

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Abstract. *A novel educational system has been created that uses the Radial Basis Function (RBF) algorithm to overcome the limitations of traditional classroom environments, which often include standardised material and fixed teaching methods. This research begins by assessing the most recent developments in interactive intelligent education systems. The advancement is made by investigating the combination of artificial intelligence and interactive teaching methods, creating a model based on neurons, and using the RBF algorithm to personalize instructional approaches and promote a self-directed learning platform. Empirical evidence consistently shows that instructional effectiveness improves as learners progress, validating the system's suitability. This novel methodology revolutionizes conventional educational methods, enhances learner proficiency, increases instructional effectiveness, and cultivates a more vibrant and engaging learning environment for pupils.*

Keywords: *Artificial Intelligence (AI); Autonomous Learning Platform; Interactive Network Intelligent Education; RBF Algorithm; Teaching Efficiency.*

1. INTRODUCTION

As the information era has progressed, computers have increasingly become ubiquitous in people's everyday lives. Data transmission across networks has evolved beyond introductory text to multimedia content, photos, audio, and video. With the growing prevalence of data transport, the size of data files is continuously expanding, which places more strain on computer networks. As computer network bandwidth grows, network streaming media technology has also significantly increased. The key factors contributing to this progress are data compression coding technology and network media transmission technology. The advent of streaming media technology has effectively facilitated the widespread adoption of online education, leading to significant transformations in both people's lives and the field of education (Xu & Ouyang, 2022). Due to scientific and technological progress, online education has become more prevalent. The education sector has specifically included multimedia technology in online education. The use of multimedia technology in online education has led to substantial transformations in instructional delivery methods. Several academics have proposed that the effective utilisation of different forms of media may enhance the comprehensibility, engagement, and practicality of information compared to conventional techniques. Allowing students to engage in discussions indicates that multimedia technology can stimulate students' learning and enhance the clarity of courses (Holmes & Porayska-Pomsta, 2022).

Consequently, multimedia technology as a pedagogical approach to online education is rising, enhancing the visual appeal and variety of online learning experiences (Chen et al., 2022). In today's rapidly advancing information technology era, educational institutions increasingly implement extensive digitalisation efforts, particularly schools. Among these efforts, the establishment of network education is of utmost importance. Network education offers numerous advantages over traditional education, including sharing existing educational resources and providing enhanced

services to a broader audience. Additionally, it can generate more significant economic benefits for the school.

2. STATEMENT OF THE PROBLEM

Although artificial intelligence (AI) and mobile technologies have made fast progress, incorporating these breakthroughs into educational institutions typically encounters substantial obstacles. Existing educational systems have challenges successfully using AI to customise learning experiences according to individual requirements. This is further exacerbated by the inconsistency in the availability and proficiency of mobile technology among students and educators, which might impede the acceptance of mobile-based learning solutions. Furthermore, using AI systems to collect and analyse substantial quantities of personal data for customising learning raises ethical problems and data privacy issues. This project seeks to fill the void in the efficient integration of AI and mobile technologies in educational environments, focusing on assuring accessibility, ethical use, and optimising learning results. Resolving this challenge is crucial since the future of education depends more and more on technology to address the requirements of different learners and enhance educational fairness and effectiveness.

3. LITERATURE REVIEW

3.1 Advancing Mobile Education with AI and Interactive Tech

Peramunugamage, A. et al. (2023) provide their research results on using mobile technology in education in this area. Their project aims to facilitate a community educational experience by allowing simultaneous access to instructional information via shared playlists and network coverage (Peramunugamage et al., 2023). The paper presents the "Malleable Mobile Education System," created by Siddiqui, S. T. et al. (2022), that utilises localisation and peer-to-peer networking to offer education (Siddiqui et al., 2022). Dong, M. (2022) presents Sequencer404, a VoIP-based system that uses a voice sequencer to enable multiple users to engage and manage instructional material over telephone and Internet Protocol (Dong, 2022). In a study conducted by Onwubiko, S. G., the focus is on investigating the potential of mobile devices such as iPhones or iPads in creating social and electronic art. This study aims to overcome conventional mobile education approaches, such as using ringtones. MoPhO's research uses advanced mobile technologies to create an interactive and collaborative learning environment, including multi-touch screens, built-in sensors like accelerometers and gyroscopes, cameras, microphones, GPS, and 2G/3G data networks. This approach combines powerful computational capabilities with the flexibility of mobile devices, transforming them into educational tools (Chen & Wang, 2023). The main focus of this research is the incorporation of artificial intelligence in creating interactive online educational systems.

3.2 The Role of AI in Personalized Learning

The academic study on artificial intelligence in education has gained attention owing to its capacity to customise learning experiences. Holmes, W., and Porayska-Pomsta, K. (Eds.) explore the ethical consequences and the capacity for change of AI in their book on the ethics of artificial intelligence in education, published in 2022. They emphasise the ability of AI to customise learning materials according to the specific requirements of each learner, resulting in enhanced engagement and effectiveness. Xu and Ouyang (2022) conducted a systematic study highlighting AI technologies, such as machine learning algorithms and data analytics, to forecast student performance and tailor learning routes. This application of AI aims to improve educational results.

3.3 Mobile Learning Technologies in Education

The use of mobile technology in education has broadened the scope and availability of instructional materials. Peramunugamage, A., Ratnayake, U. W., and Karunanayaka, S. P. (2023) investigate the successful implementation of mobile collaborative learning in engineering education via their systematic study. The authors describe the incorporation of mobile applications and platforms that provide immediate communication and the exchange of resources between students and instructors, hence enhancing the accessibility and adaptability of education (Peramunugamage et al., 2023). Babitha, M. M., Sushma, C., and Gudivada, V. K. (2022) examine the trends in artificial intelligence for online tests and demonstrate how mobile technology aids in both learning and the development of safe and scalable examination systems (Babitha et al., 2022).

4. RESEARCH METHODS

4.1 Progress of Artificial Intelligence (AI)

Imagination is a distinct cognitive ability in humans that is used to create intellectual challenges, especially in the context of educational instruction. This entails the complex processing skills of a "cognitive machine," specifically engineered to integrate concepts from cognitive-forming gadgets. Marvin Minsky, widely regarded as the pioneer of Artificial Intelligence, categorised cognitive function into six fundamental dimensions: consciousness, psychology, sanity, thinking, emotion, and self-awareness (Su & Yang, 2022). These dimensions aid in deciphering the intricate mechanisms of the human brain, highlighting the importance of machine learning in online education. Professor Picard at the MIT Media Lab was the first to develop the idea of social media as a cognitive theory. This included incorporating emotional intelligence into robots, allowing them to imitate human-like observations, thoughts, and emotions (Alam, 2022). Interaction theory, a dynamic branch of study in artificial intelligence, aims to enhance the interactions between people and computing systems. Within online education, this entails using a virtual assistant similar to Siri to aid students by identifying and resolving mistakes and promoting learning, as seen in Figure 1.

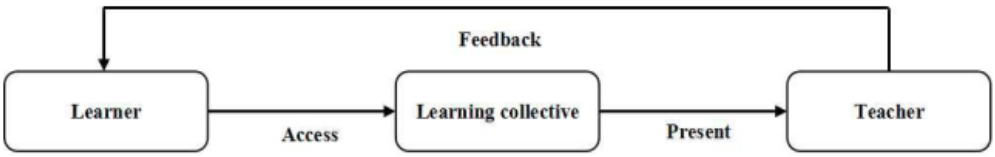

Figure 1: *Framework of Cognitive Functions in AI-Enhanced Online Education*
Source: *Fengchun Zhang et al. / Procedia Computer Science (2023)*

Students often start their integrated learning experience by accessing the learning platform, where they may demonstrate the educational benefits to instructors who specialise in human-computer interactions (Limna et al., 2022). Educators may use the feedback they get to improve their teaching methods and develop student understanding and abilities. This is mainly achieved by analysing constructive criticism, which helps create a more efficient feedback system. This cognitive-based strategy utilises developmental insights to enhance educational evaluations, resulting in improved educational results for learners in contrast to conventional techniques.

4.2 Evaluation and Application of Education Intelligent System (EIS)

The Machine Intelligent Algorithm-RBF algorithm was created for interactive education learning. The radial basis function algorithm, or RBF algorithm, is typically a neural network consisting of local neurons arranged in a network topology with five

layers (Shaikh et al., 2022). The first layer consists of unique data, which may be divided into various schooling segments and inputted into the neural network model. The second layer pertains to membership and its mathematical representation, denoted by formula (1):

$$\mu_i(x_i) = \exp\left[\frac{-(x_i - c_i)^2}{2\sigma_i^2}\right]$$

i = 1, 2, …, r; j = 1, 2, …, u the citation (Thurzo et al., 2023) is provided. The third approach involves interpreting the rules and deriving generalisations based on

$$\phi_i = \exp\left[-\frac{\|X - C_i\|^2}{2\sigma_i^2}\right],$$

analysing the most minor and significant cases. Determine the result of the j[th] rule, as shown by Equation (2):

where $c_j = (c_{1i}, \ldots\ldots, c_{ri})$ The j-th RBF unit's centre is denoted as the representation (Haderer & Ciolacu, 2022). The RBF neural network has a property where the activity level increases when the neurons are positioned closer in space. This characteristic aligns with the expression of factors that influence conversational sound instruction. The fourth layer is the normalisation layer, where the nodes must align with the output of the fuzzy rule node and its j-th node N_i, as defined by formula (3):

$$\Psi_i = \frac{\phi_i}{\sum_{k=1}^{N} \phi_k}$$

j = 1, 2, …, u (Khosravi et al., 2022). The fifth layer is a generator that performs various musical evaluations based on the TS fuzzy model in the RBF algorithm, and its output is shown in Equation (4).

$$y(x) = \frac{\sum_{i=1}^{u}\left[(a_{i0} + a_{i1}x_1 + \cdots + a_{1r}x_r)\exp\left(-\frac{\|x - c_i\|^2}{2\sigma_i^2}\right)\right]}{y(x) = \sum_{k=1}^{u} w_k \cdot \Psi_k}$$

w_k is the connection that represents the kth law, that is, the balance of the product of the weight of the product as shown in Equation (5).

The interactive learning approach utilises the RBF algorithm and incorporates the proposed algorithm into the design platform. It displays the complete algorithm while writing code and leverages the platform's interface function. This approach resembles an interactive learning mode (Chaudhry & Kazim, 2022; Khosravi et al., 2022). Among them, X represents the proportion of study time dedicated to improving educational skills for students who performed well on their research papers. X also represents the distribution of latent layers in online educational software designed to enhance student success. These training models have balanced latent layers. Y represents the highest score achieved in each course. In order to streamline the RBF algorithm, the second, third, and fourth levels are consolidated into the hidden layer. In contrast, the first and fifth layers are input and output, respectively. The first training utilises the first m of schooling data in big data. Subsequently, the RBF model enhances its assessment by refining knowledge and software platform adjustments to measure students' achievement continuously. The building schematic is seen in Figure 2.

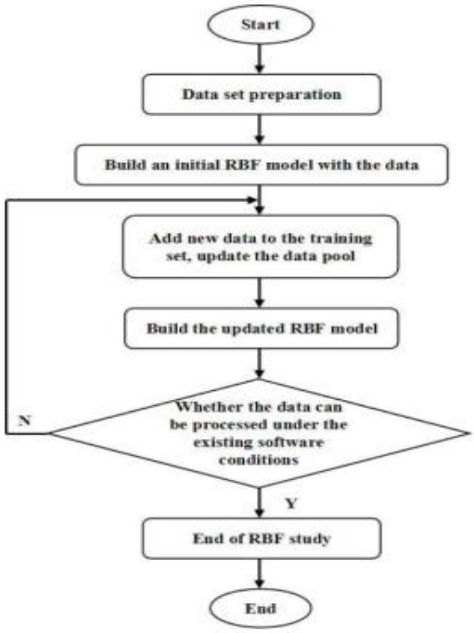

Figure 2: *Simplified RBF Algorithm Structure for Education*

5. RESULTS AND DISCUSSION

The analysis indicates that the network topology model used in interactive online education intelligently adjusts a distribution approach to suit the different levels of faculty, students, and administrators. This includes providing different courses and roles to each group. This methodology streamlines the use of sophisticated systems in academic management, improving the organisation and incorporation of many educational disciplines via efficient teaching and learning assessments. Interactive online education cultivates various skills and abilities, including further learning, fundamental topics, vocational training, and other educational benchmarks (Chaudhry & Kazim, 2022). Figure 3 depicts a schematic of this concept.

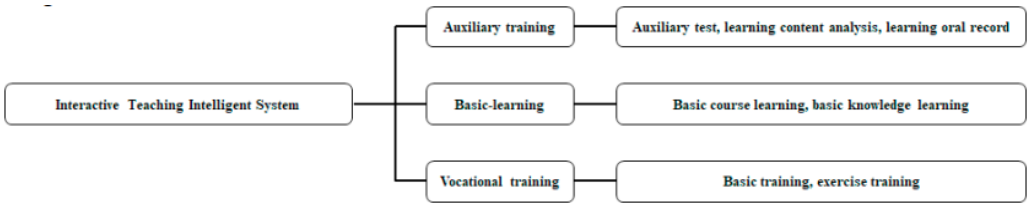

Figure 3: *Network Topology Model for Interactive Online Education*

Every system model depends on a backend database supported by SQL Server and includes all project management and data solutions. As previously specified, the intelligent education system's network structure integrates both software and hardware components. This configuration comprises a database server environment with a system specification of 4G RAM, a 500G solid-state disc, and a twin CPU Xeon processing system. The Veritas Backup program backs up the system and application software. The application server operates on MS Windows 2007 Enterprise Edition, with WinCC as the software system.

CONCLUSION

An interactive online education system improves the learning experience and boosts the material quality for students. This study begins by delineating critical

components of online education and scrutinising local and foreign research advancements, emphasising the advantages of online learning platforms. This text explores the neural network model, explicitly highlighting the use of the Radial Basis Function (RBF) algorithm to enhance intelligent teaching approaches. This strategy uses learner situations to enhance the effectiveness of educational interactions intelligently. Future research endeavours to enhance these systems by using more user-friendly interface designs and improving the reliability and accuracy of intelligent education systems by analysing more extensive data sets.

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