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Research on an AI-Driven Music Teaching System in Colleges and Universities Based on RBF Neural Network

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ABSTRACT

Artificial intelligence technology provides support for the innovation of traditional music teaching mode. This paper proposes an intelligent music teaching system, which integrates the interactive teaching concept and radial basis function neural network. The system constructs an evaluation model that includes four dimensions: talent, teaching environment, technical level, and initiative. The research compares the teaching effect of traditional teaching mode and artificial intelligence-driven teaching mode in university classrooms. The results show that the experimental group is obviously superior to the control group in comprehensive score, satisfaction, and popularity. The radial basis function neural network model constructed in this paper has good nonlinear mapping ability and generalization performance. The system supports teachers' teaching analysis and personalized feedback, which effectively improves the teaching effect. This study provides a reference for the intelligentization of music education in colleges and universities and education in other fields.

KEYWORDS

Artificial Intelligence, Radial Basis Function, Neural Network Model, Music Teaching System, Music Education

INTRODUCTION

Artificial intelligence (AI) technology-driven refers to the use of AI-related technologies as the core driving force to propel development and transformation across various fields (Calegari et al., 2020; Chen et al., 2020). AI involves computers simulating human intelligence to enable machines to learn, reason, judge, and make decisions, thereby automatically executing tasks or solving complex problems. AI technology has strong learning ability, which can continuously optimize algorithms and improve performance by learning from massive data (Al Ka'bi, 2023; Rahmani et al., 2021). For instance, image recognition systems first achieve significantly higher accuracy in identifying various objects after learning from massive image datasets (Wang et al., 2025). Second, they process information at extraordinary speeds, analyzing and computing vast amounts of data instantaneously, a feat beyond human capability. Third, they demonstrate high adaptability, adjusting to different tasks and environments (Popa et al., 2025). After collecting large volumes of raw data, they undergo preprocessing steps like cleaning and labeling to support subsequent analysis. Next, machine learning algorithms come into play, categorized into supervised learning, unsupervised learning, and reinforcement learning (Gupta & Pandya, 2022; Park & Park, 2020; Sadaram et al., 2023;

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Sarker, 2021). Finally, once model training is complete, it is deployed for practical application. AI is constantly optimized and refined based on real-time data to realize intelligent decision-making and task execution, which has played an increasingly important role in many fields such as transportation, medical care, communication, and education (Huang et al., 2025; Song et al., 2022).

AI applications in education have progressively become a core driver for educational progress and reform (Hu et al., 2023; Li et al., 2025). Deepening the integration of AI with education has emerged as a global focus for governments and researchers (Mariam et al., 2024). AI technology is also viewed as a crucial means to drive educational reform, transform talent cultivation models, and advance educational modernization in China. Education-related departments in China encourage teachers to utilize intelligent assistants and high-quality learning resources to transform traditional teaching methods, thereby enhancing instructional effectiveness. This means that the application of intelligent teaching assistants in education will gradually become a key research area and practical application method for integrating AI with education (Knox, 2020).

Although the application prospect of AI in the field of education is broad, the current music teaching in colleges and universities still faces the core problems of lagging interactive feedback, strong subjectivity of evaluation criteria, and lack of personalized guidance. The existing intelligent music teaching system often lacks the high-precision nonlinear modeling ability for the multi-dimensional characteristics of music performance. In view of this, the purpose of this study is to build an interactive intelligent music teaching system based on radial basis function (RBF) neural network to realize objective quantitative evaluation and real-time personalized feedback on the music learning process. In this study, an RBF intelligent evaluation model with a five-layer network architecture was designed, and a semester-long empirical study was conducted through comparative experiments on 200 freshmen majoring in music. This study will focus on analyzing the error convergence characteristics of the model in four dimensions: talent, teaching environment, technical level, and initiative. Additionally, this study strictly compares the differences between the experimental group (assisted by an intelligent system) and the control group (traditional teaching) in teaching satisfaction, skill score, and model prediction accuracy. This study aims to help students acquire music knowledge, provide effective educational tools, and provide practical value and positive significance for music pedagogy research.

LITERATURE REVIEW

The Development and Current State of AI

The AI-driven university music teaching system is an innovative educational platform that integrates AI technology with music pedagogy. It aims to innovate the traditional music teaching model, enhance teaching effectiveness, and improve the students' learning experience (Lu, 2025). As illustrated in Figure 1, the system design comprises several key modules.