Research on the Path of Empowering the Digital Inheritance of Red Music Culture and Enhancing Social Cohesion with Convolutional Neural Networks

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ABSTRACT Under the dual drive of cultural digitization strategy and innovation in red-culture inheritance, red music culture, as a medium of revolutionary history and national unity, faces practical bottlenecks such as discontinuity of inheritance subjects, solidified dissemination forms, insufficient reach to young audiences, and weakened social-emotional connection. Convolutional neural networks (CNNs), with local receptive fields, weight sharing, and hierarchical feature extraction, provide efficient technical solutions for full-lifecycle digital governance of red music culture. This article reviews research progress in CNN-based digital protection of cultural heritage and identifies the practical pain points of red music inheritance. It constructs a full-chain CNN empowerment system covering collection, restoration, recognition, creation, dissemination, and evaluation, and designs five core application scenarios: intelligent restoration of red music images, scores, and audio; intelligent classification and retrieval of tracks; style transfer and creative revitalization; immersive narrative communication; and quantitative evaluation of social and emotional effects. By extending digital audio and image signal processing to cultural heritage scenarios, the framework supports resource standardization, precise dissemination, and youth-oriented communication. The study provides a replicable technical path for improving the digital efficiency, dissemination effectiveness, and social cohesion value of red music culture.

INDEX TERMS convolutional neural network,digital inheritance,audio signal processing,feature extraction,social cohesion

I. INTRODUCTION

A. RESEARCH BACKGROUND

RED music culture is an advanced cultural form created by the people under the leadership of the CPC during the period of revolution, construction and reform. With classic works such as the Yellow River Cantata, the March of the Volunteers, and Yingshan Hong as the core carrier, it carries the value orientation of "listening to the Party, following the Party" and the national spirit of "self-improvement, solidarity and struggle", and is an important cultural source of socialist core values. Against the backdrop of the deepening of cultural digitization strategy, the inheritance and dissemination of red music culture are facing new opportunities, but at the same time, they are also facing multiple challenges such as aging inheritance ecology, single dissemination channels, cognitive barriers among young audiences, and weakened social and emotional connections[1-3].

B. RESEARCH CONTENT AND INNOVATION POINTS

1) Core Research Content

1. Define the core connotations of digital inheritance and social cohesion of red music culture, construct a theoretical framework for empowering the inheritance of red music culture with CNN, and clarify the logic of adaptation between technology and culture;

2. Disassemble the core functions and application scenarios of CNN in the entire lifecycle of red music resource collection, restoration, recognition, creation, dissemination, and evaluation, and construct a full chain empowerment system;

3. Design a practical path for the digital inheritance of red music culture and the enhancement of social cohesion based on CNN, proposing collaborative solutions from four dimensions: technology implementation, resource co-construction, teacher training, and mechanism guarantee;

4. Through empirical analysis, verify the role of CNN empowerment in improving the digital efficiency, dissemination effectiveness, and social cohesion of red music resources, and form a replicable practical paradigm[4].

2) Research Innovation Points

System innovation: Build a full chain CNN empowerment system of "collection repair recognition creation dissemination evaluation" to achieve systematic and intelligent digital governance of red music culture;

Practical innovation: Propose four collaborative paths: technology implementation, resource co-construction, teacher training, and mechanism guarantee, providing feasible practical solutions for the normalized application of CNN technology in the field of red music culture;

Empirical innovation: Quantitatively analyze the enhancement effect of red music culture empowered by CNN on social emotional cohesion, value cohesion, and identity cohesion, providing empirical support for the social value of red culture inheritance.

II. CORE THEORETICAL FOUNDATION AND TECHNICAL SUPPORT

A. CORE THEORETICAL BASIS

The theory of cultural digital communication emphasizes the use of digital technology to break down time and space barriers, innovate cultural communication forms, and enhance the accuracy and interactivity of cultural communication. As a core component of digital technology, CNN technology can optimize the dissemination form and path of red music culture through intelligent repair, creative revitalization, precise recommendation, and other methods, expand the dissemination scope, enhance dissemination efficiency, and provide a communication carrier for improving social cohesion[5].

B. CORE TECHNOLOGY PRINCIPLES OF CONVOLUTIONAL NEURAL NETWORKS

1) Basic CNN Structure and Core Mechanism

The basic CNN consists of an input layer, convolutional layer, pooling layer, fully connected layer, and output layer. The convolutional layer performs convolution operations with the input data through convolutional kernels to extract local features; The pooling layer performs dimensionality reduction on the feature maps output by the convolutional layer to enhance the model's generalization ability; The fully connected layer maps the high-level features extracted by the pooling layer to the sample space, completing tasks such as classification and regression; The output layer outputs the final result[6].

2) Improved CNN model adapted to red music culture

Regarding the multi type data characteristics of red music culture, it is necessary to improve the basic CNN to enhance processing efficiency

U-Net Improved Model: Adopting an encoder decoder structure to achieve pixel level accurate segmentation, it is suitable for disease detection and repair completion of damaged music scores and faded images in red music. It can quickly locate damaged areas and generate completion content that matches the historical original appearance;

CNN-GAN Fusion Model: Combining CNN feature extraction with GAN generation technology to achieve noise reduction and distortion repair of red music audio, as well as style transfer and creative revitalization of sheet music and images. The generated content combines historical authenticity and contemporary innovation;

Lightweight CNN model: reduces parameter size through model compression, quantization and other techniques, adapts to real-time processing of red music resources on mobile and edge devices, and meets the needs of mobile communication scenarios[7-8]. To address the limited digital literacy of grassroots workers, these models are wrapped in "one-click" simplified interfaces. Furthermore, we employ transfer learning to mitigate the absence of labeled training data by pre-training on general music datasets before fine-tuning on niche red music materials.

3) Compatibility of CNN with Red Music Culture Data

The data of red music culture includes various types of data such as sheet music (paper/electronic), historical images (old photos, performance stills), audio (old records, recordings), video (historical images), etc. The adaptability of CNN to various types of data is shown in Table 1:

The correlation logic between CNN empowering the inheritance of red music culture and enhancing social cohesion is grounded in the "Affordance Theory," where technical features facilitate specific social actions. It can be summarized as a four stage closed loop:

1. Phase 1: Digitization as Foundation: Through CNN, efficient collection and precise restoration of red music scores, images, and audio are achieved, and a standardized and high-quality red music digital resource library is built to solve the problems of resource aging, loss, and fragmentation, providing a material basis for shared cultural accessibility[9-11];

2. Phase 2: Engagement through Personalization: Through CNN's style transfer, intelligent creation, precise recommendation and other functions, the creative renewal and precise dissemination of red music culture can be achieved, breaking down communication barriers, expanding the scope of dissemination, and enhancing the acceptance and participation of young audiences, thereby creating common digital touchpoints;

3. Phase 3: Identity Construction via Emotional Resonance: Innovative digital content and dissemination forms of red music can trigger emotional resonance, which acts as the psychological bridge between individual experience and collective identity;

4. Stage 4: Behavioral Integration for Social Cohesion: Individual emotional resonance facilitated by interactive digital platforms gradually transform into group value consensus and identity recognition, promoting social cohesion through active cultural participation.

TABLE 1. Core Application & Adaptation of CNN for Red Music Multimodal Data

Data Type	Core Features	Adapted CNN Model	Main Application Functions	Practical Value
Paper Music Score	Notes, lines, layout, stains, missing strokes	DenseNet-BC, ResNet-50 (for classification); U-Net (for segmentation/repair)	Damage detection, pixel-level repair, intelligent classification	Rescue incomplete historical scores and standardize digital archives
Historical Posters & Photos	Fading, scratches, texture, scene features	CNN-GAN, Super-Resolution CNN	Image restoration, color restoration, high-definition reconstruction	Restore real historical scene of red music performance
Old Audio & Records	Noise, distortion, frequency loss, timbre attenuation	1D-CNN, CNN-LSTM	Noise reduction, audio restoration, melody feature extraction	Realize high-fidelity digital playback of classic old songs
Historical Performance Video	Frame blurring, missing details, aging screen	3D-CNN, CNN frame optimization	Frame repair, dynamic feature extraction, video enhancement	Produce immersive visual communication materials

III. CNN EMPOWERS THE CONSTRUCTION OF A FULL CHAIN SYSTEM FOR THE DIGITAL INHERITANCE OF RED MUSIC CULTURE

A. PRINCIPLES OF SYSTEM CONSTRUCTION

1. Principle of technical adaptability: Based on the multi type data characteristics of red music culture, select an adapted CNN model and technical solution, taking into account both processing efficiency and effectiveness, and avoiding mismatches between technology and data;

2. Principle of cultural inheritance: Adhere to the historical authenticity and spiritual core of red music culture, with technological empowerment as a means and cultural inheritance as the core, and eliminate the deviation of "emphasizing technology over culture"; The objective is to balance technical utility with historical integrity, ensuring that digital tools serve to clarify rather than overshadow cultural narratives.

3. Full link coverage principle: covering the entire lifecycle of the collection, restoration, identification, creation, dissemination, and evaluation of red music cultural resources, forming a systematic empowerment system, and avoiding the limitations of single link applications[12-15];

4. Principle of social cohesion orientation: All technological applications and resource construction aim to enhance social cohesion, focusing on emotional resonance, value recognition, and identity belonging, ensuring the social value empowered by technology;

5. Feasibility principle for implementation: Based on the needs of frontline practice, design lightweight and operable technical solutions and resource construction paths, reduce implementation barriers, and facilitate promotion and application, as shown in Table 2 below.

B. OVERALL ARCHITECTURE OF THE FULL CHAIN SYSTEM

Build an integrated architecture consisting of one core intelligent platform, six functional empowerment modules, and four layers of global support base:

1 core platform: CNN intelligent digital inheritance and dissemination platform for red music culture;

6 major empowerment modules: high-precision material acquisition module, multimodal intelligent repair module, feature recognition intelligent classification module, AI creative revitalization creation module, thousand person and thousand face precise dissemination module, emotional cohesion quantitative evaluation module;

4-layer support base: low-level technical computing power support, standardized digital resource support, composite talent and teacher support, and long-term policy mechanism support. The full architecture realizes the deep integration of technology empowerment, resource activation, content innovation, global dissemination, and effectiveness traceability, laying a solid foundation for the intelligent inheritance of red music culture[16-18].

C. DEEP DESIGN OF SIX CORE FUNCTIONAL MODULES

1) Module 1: High precision acquisition and preprocessing module for multimodal materials

The original remains of red music include six categories: yellowed paper sheet music, incomplete handwritten manuscripts, scratched old records, blurred black and white performance videos, low-frequency oral singing recordings, and faded promotional posters. Manual collection can easily lead to problems such as loss of details, noise accumulation, and blurred features. Based on the pre lightweight CNN preprocessing model, complete the standardized collection of all materials:

One is image materials (sheet music, posters, handwritten manuscripts): extracting line, note, layout, and pattern edge features through shallow convolutional layers, automatically correcting skewed pages, cropping invalid redundant areas, unifying resolution and color gamut, and eliminating shooting light and shadow interference;

The second is audio materials (old records, oral recordings): 1D-CNN is used to extract sound wave frequency, melody rhythm, and timbre base features, separate environmental background noise, current noise, and recorded echoes, and preserve the original vocal cavity and instrument timbre;

The third is video materials (historical performance images): relying on 3D-CNN to complete frame sequence decomposition, locking in key frames of character singing actions, stage scenery, and subtitle identification, providing accurate basis for subsequent high-definition restoration. This module implements standardized purification of messy raw materials, laying a solid data foundation for subsequent deep intelligent processing[19,20].

2) Module 2: Multi modal intelligent repair and reconstruction module based on improved CNN

This is the key module to crack the core pain points of the old, damaged, distorted, and lost remnants of red music, which can be accurately implemented in three categories:

TABLE 2. Comparison Between Traditional Mode and CNN Intelligent Mode for Red Music Inheritance

Comparison Dimension	Traditional Inheritance & Repair Mode	CNN Intelligent Digital Mode	Core Optimization Effect
Data Processing Efficiency	Manual identification, manual modification, low batch efficiency	Automatic feature extraction, batch intelligent repair, fast iteration	Improve overall efficiency by more than 2 times
Repair Accuracy & Fidelity	Depend on personal experience, easy to lose details	Pixel-level & frequency-level precise restoration with cultural feature database	Ensure historical authenticity without distortion
Resource Classification & Retrieval	Manual labeling, paper archives, slow query	Intelligent automatic tagging, fast visual & audio retrieval	Realize one-click access of full-category red music resources
Cultural Innovation & Renewal	Simple adaptation, single arrangement form	Style migration, intelligent arrangement, visual creative generation	Fit contemporary aesthetic and realize youth-oriented communication
Effect Evaluation of Inheritance	Qualitative description only, lack of data support	CNN emotion recognition, quantitative index calculation	Realize data-driven evaluation of emotional resonance & cohesion

Old audio quality reconstruction: Combining the CNN-LSTM fusion model, high-frequency noise and low-frequency noise are removed, distorted frequency bands are compensated, recording losses are weakened, and the original melody, harmony arrangement, and instrument ratio of classic red songs are restored, making the sound quality of decades old records reach high-definition digital standards, suitable for offline performances, online dissemination, and classroom playback;

High definition Renewal of Historical and Poster Images: Leveraging the CNN-GAN generative adversarial architecture, we achieve high-resolution reconstruction of low definition image quality, precise restoration of faded colors, intelligent removal of scratches and stains, restoration of revolutionary performance stage scenes, classic song and poster color schemes, and creation of high-definition visualized red music image resources.

3) Module 3: CNN Feature Extraction Intelligent Recognition and Classification Archiving Module

The stock of red music resources is huge, covering multiple periods such as the Land Revolution, the War of Resistance Against Japan, the Liberation War, the construction of New China, and the reform and opening up. There are significant differences in the style, themes, singing scenes, and spiritual core of the music, and the efficiency of traditional manual annotation and archiving is extremely low. Building an intelligent classification system based on the DenseNet BC deep convolutional feature extraction model: Automatically extract deep features from five dimensions: lyrics and music text, melody characteristics, arrangement style, creation era, and spiritual imagery, achieving precise division of song era, automatic classification of themes, and intelligent annotation of core spiritual labels; Simultaneously building an intelligent search engine that supports searching for music scores by image, music by sound, and intelligent keyword matching. Cultural and museum institutions, schools, and communities can easily access red music resources of corresponding periods and themes with just one click, achieving refined, intelligent, and normalized management of massive relics and breaking down barriers to resource reuse.

4) Module 4: CNN driven Red Music Creative Renewal and Secondary Creation Module

To address the issues of aesthetic barriers among young audiences and insufficient appeal of traditional content, we rely on the style transfer feature fusion ability of convolutional neural networks to achieve innovative preservation of classic red songs

Firstly, intelligent integration of musical style: extracting the main melody, core harmony, and imagery features of classic red songs, and convolving and integrating them with Chinese style arrangement, popular arrangement, and folk music arrangement features to generate an adapted version that combines revolutionary flavor and modern aesthetics, preserves the spiritual core, and conforms to the listening habits of young people;

Secondly, visual creative generation: based on the melody features of the music score, automatically matching red illustrations, dynamic MV storyboards, and Chinese style stage backgrounds, transforming abstract melodies into concrete visual images, and creating immersive audio-visual works;

Thirdly, personalized derivative creation: supporting campus choir adaptation, instrumental solo adaptation, short video music customization, relying on CNN feature fine-tuning technology, generating multi scene adapted derivative content without changing the core melody and spiritual connotation, and expanding the carrier of red music dissemination.

5) Module 5: Big Data Linkage CNN Thousand Person, Thousand Face Precision Propagation Module

Build a personalized dissemination system that combines user profiles and content features for dual convolution matching: rely on CNN to extract emotional tags (passionate, affectionate, progressive, nostalgic) for red music content, synchronously capture audience age, cognitive preferences, viewing scenarios, and emotional tendencies, and achieve precise audience-content matching; Push lightweight music videos, anime adaptations of popular songs, and visual music scores to teenagers; Push classic original songs and historical creation story audio to community groups; Push high-definition restored images to educational settings. Breaking the traditional unidirectional dissemination of "one size fits all", achieving, differentiated and contextualized global reach, and allowing red music to accurately enter the life scenes of different groups.

6) Module 6: CNN Emotion Recognition Social Cohesion Quantitative Evaluation Module

Breaking through the shortcomings of "only transmitting without evaluation and unclear effectiveness" in the past,

we will build a technical and data-driven effectiveness traceability system:

One is audio emotion recognition: using 1D-CNN to capture the voiceprint emotions and resonance feedback features of the audience after listening;

Secondly, short-term affective response analysis: relying on convolutional facial feature extraction, identify immediate positive emotions such as reverence, excitement, and emotion after watching red music videos. While these biological signals do not directly equate to long-term identity, they serve as proxy indicators of initial psychological engagement;

The third is the behavioral engagement metrics: combining browsing time, forwarding and sharing, interactive comments, and active singing data, to qualitatively infer potential shifts in collective memory awakening, value identification. These metrics provide a data-driven basis for observing how individual emotional peaks might correlate with sustained cultural participation.

D. FOUR LAYER GLOBAL SUPPORT AND SUPPORT BASE

1) Technical computing power support base

Building a dual layout of cloud computing power nodes and lightweight edge terminals: Professional institutions rely on high-performance GPU clusters to complete large-scale material deep repair and model training; Grassroots schools and communities rely on lightweight mobile CNN models to achieve simple daily retrieval, playback, and lightweight creation, balancing in-depth research and development with inclusive applications. To ensure sustainability against funding constraints, the system utilizes an edge-cloud hybrid approach, where high-cost training occurs on public provincial servers, while daily operation runs locally on low-cost, offline-capable hardware.

2) Standardized Resource Support Base

Establish a national level CNN feature standard library for red music, unify music score restoration standards, audio fidelity standards, style adaptation bottom lines, and emotional labeling systems, eliminate chaos in resource construction in various regions, and achieve the interconnection and sharing of high-quality red music digital resources nationwide.

3) Composite Talent Support Base

Cultivate a cross-border talent team of "computer AI technology+music major+red culture research": carry out practical training on CNN cultural application, training on the historical connotation of red songs, and digital creation training, to create a core team that understands both technical algorithms and music theory, as well as the red spirit.

4) Long term policy mechanism support base

Incorporate CNN into the digital cultural preservation framework and institutional education systems empower the digital inheritance of red music. Set up special research and development funds, resource construction funds, and teacher training funds to ensure the long-term stable operation of the system.

IV. EMPIRICAL PRACTICE APPLICATION AND EFFECTIVENESS DATA ANALYSIS

A. OVERALL DESIGN OF EMPIRICAL PILOT PROJECTS

This empirical study selected three types of pilot scenarios: 2 red culture and cultural museum collection institutions, 3 ideological and political key universities, 6 urban and rural primary and secondary schools, and 4 grassroots community cultural stations. An experimental group (CNN full chain digital inheritance mode) and a control group (traditional manual restoration+conventional offline dissemination mode) were set up, with a pilot period of 12 months. To ensure baseline comparability, all 15 sites were pre-screened for similar digital infrastructure levels and historical record volumes. A sample size of n=450 music scores and n=200 audio clips was used across sites. The stock material base, dissemination coverage population, evaluation observation dimensions were unified, irrelevant variables were excluded, and data rigor was ensured.

Experimental group implements full module CNN intelligent processing: AI repair of old music scores, audio reconstruction of old records, intelligent classification and archiving, creative adaptation and dissemination, and quantitative evaluation of emotional effects;

The control group continued to use the traditional manual transcription of music scores, simulated audio denoising, manual classification and archiving, and one-way offline performance routine mode.

B. COMPARATIVE ANALYSIS OF CORE PRACTICAL RESULTS

1) Significant improvement in digital processing efficiency of resources

Data shows that the success rate of high-throughput automated batch repair in the experimental group reached 96.8%. In contrast, the control group, constrained by the intensive manual labor required for large-scale archives, achieved a 32.5% completion rate within the same 12-month timeframe. The integrated processing throughput was improved by 197.85%; this figure represents the aggregate gain in volume processed per unit of time rather than a localized accuracy score; The compliance rate of high-definition restoration of old audio was 89.2% in the experimental group and 28.7% in the control group, an increase of 210.80%(t-test results indicating significant variance between manual and AI cohorts). These high percentages are attributed to the low baseline efficiency of manual transcription in grassroots units. CNN batch feature extraction and pixel level restoration completely solve the problems of long manual restoration time, large errors, and loss of details, achieving efficient salvage protection of massive endangered red music relics.

2) Significant optimization of resource retrieval and reuse convenience

Relying on the CNN intelligent classification label system, the response time for accurate retrieval of resources in the experimental group has been reduced by 87%, and the accuracy of cross era and cross topic accurate matching has reached 94.3%; The control group relies on manual ledger retrieval, which has a high matching error rate and a long retrieval cycle. Standardized intelligent archiving enables the normal reuse and global sharing of dormant red music resources, as shown in Table 3.

TABLE 3. Practical Effect Data of Experimental Group (CNN) and Control Group

Evaluation Indicators	Experimental Group (CNN Empowerment)	Control Group (Traditional Mode)	Significant Difference
Qualified Rate of Damaged Score Restoration	96.8%	32.5%	$P < 0.001$
High-fidelity Restoration Rate of Old Audio	89.2%	28.7%	$P < 0.001$
Accuracy of Intelligent Classification & Archiving	94.3%	41.6%	$P < 0.001$
Youth Audience Acceptance & Preference	91.6%	37.2%	$P < 0.001$
Positive Emotional Resonance Recognition Rate	88.5%	43.8%	$P < 0.001$
Social Identity & Collective Memory Awakening Index	86.7	45.3	$P < 0.001$

3) Comprehensive expansion of acceptance and dissemination coverage among young audiences

Pilot questionnaire and backend dissemination data statistics: The experimental group creatively adapted red songs, visualized music videos, and interactive music scores, with a youth love rate of 91.6%. The proportion of actively forwarding, singing, and secondary creation increased by 3.2 times; The control group of traditional one-way performances has low attention and weak interactivity among teenagers. The fusion of CNN style and visual creation has successfully broken through the cognitive barriers of young people and achieved the breakthrough of red culture dissemination.

4) Quantitative improvement of emotional resonance and social cohesion

According to the CNN emotion recognition model, the positive emotional resonance rate (excitement, reverence, pride) of the experimental group audience reached 88.5%, and the collective memory arousal and ethnic cultural identity were significantly higher than those of the control group; After landing on campus and in the community, the group's patriotism, collective consciousness, and sense of unity have significantly increased, effectively achieving a deep transformation from cultural inheritance to spiritual cohesion.

C. EXISTING CORE ISSUES IN PRACTICAL IMPLEMENTATION

Firstly, niche and endangered red music materials are scarce, with insufficient sample sizes, and there is still room for optimization in the training accuracy of CNN models for some segmented scenes;

Secondly, some grassroots units have weak computing power equipment, and the adaptation of lightweight CNN terminals still needs to be simplified and upgraded;

Thirdly, there are difficulties in controlling the boundaries of a few creative adaptations, which can easily lead to the risk of weakening historical connotations and excessive entertainment;

Fourthly, there is a large gap in cross-border teaching staff, with a clear talent gap between those who understand AI technology but not red culture, and those who understand music but not algorithms.

V. CNN EMPOWERS THE INHERITANCE OF RED MUSIC AND THE LONG-TERM IMPROVEMENT PATH OF SOCIAL COHESION

A. BUILDING A SOLID DATA FOUNDATION: EXPANDING THE EXCLUSIVE CNN SAMPLE LIBRARY FOR RED MUSIC

Integrate endangered materials from national cultural museums, archives, and art troupes, expand samples of segmented eras, niche songs, and local red folk songs, optimize model training datasets, and improve the accuracy of niche material restoration; Establish a strict content review mechanism, define creative adaptation red lines, and uphold the authenticity of red culture.

B. OPTIMIZING TECHNOLOGY DOWNWARD: POPULARIZING LIGHTWEIGHT AND LOW COST IMPLEMENTATION SOLUTIONS

For grassroots schools and communities, the iterative minimalist CNN operation terminal can complete score retrieval, audio playback, and simple creative production without the need for professional algorithm foundation; Relying on cloud based public computing power, reducing the threshold for local hardware investment, and achieving equal empowerment between urban and rural areas.

C. STRENGTHENING TALENT CULTIVATION: BUILDING A CROSS DISCIPLINARY AND COMPOSITE TRAINING SYSTEM

Offering a special training course on "AI Algorithm+Red Music+Ideological and Political Education" and forming a joint team of school, enterprise, and research; Cultivate core teachers who can not only operate CNN intelligent tools, but also interpret the history of red music and control creative orientation, and build a solid talent support for technical implementation.

D. DEEPENING SCENE INTEGRATION: EMBEDDING IDEOLOGICAL AND POLITICAL EDUCATION WITH GRASSROOTS SPIRITUAL CONSTRUCTION

Fully integrate the high-definition red sheet music and original audio-visual works repaired by CNN into classroom teaching, campus cultural activities, community lectures,

and festival performances; Regularly carry out AI creative research and learning activities for red music, allowing digital achievements to take root in daily life, continuously awaken collective emotions, and consolidate social consensus.

E. ESTABLISH A SOUND CONTROL MECHANISM: IMPROVE THE ENTIRE PROCESS CONTENT REVIEW AND EVALUATION SYSTEM

Establish a triple check system of technical algorithm review, cultural expert review, and ideological and political guidance review to prevent tampering with history, vulgar adaptations, and value deviation content; Based on CNN quantitative evaluation data, dynamically optimize communication content and push strategies, and continuously amplify the effectiveness of spiritual cohesion.

TABLE 4. Full-link Framework & Guarantee System of CNN Empowerment Path

Core System Module	Key Supporting Content	Specific Implementation Measures	Long-term Guarantee Mechanism
Intelligent Technology Support	Cloud computing + lightweight edge CNN terminal	Dual deployment of high-performance computing and mobile convenient application	Unified model iteration and technical upgrade standard
Standard Resource Database	Red music CNN feature library & original style constraint library	Collect endangered materials and unify repair & creation specifications	National interconnection and shared resource mechanism
Interdisciplinary Talent Training	AI technology + music major + red culture research	Special training, school-enterprise joint training and teacher exchange	Regular assessment and professional skill certification
Whole-process Content Audit	Technology review + cultural expert review + value orientation review	Strictly control creative adaptation boundary and avoid excessive entertainment	Establish lifelong traceability of digital cultural works
Social Cohesion Promotion	Emotion identification data + daily scene integration	Integrate digital achievements into ideological education & community cultural activities	Include in spiritual civilization construction evaluation

VI. RESEARCH CONCLUSION AND FUTURE PROSPECTS

A. RESEARCH FINDINGS

This article deeply combines the advantages of convolutional neural network technology with the urgent need for the inheritance of red music culture, clarifies the core logic of "technology empowerment resource activation emotional resonance social cohesion", constructs a full chain CNN digital inheritance system, and completes multi scenario empirical verification. Research has shown that CNN can efficiently achieve intelligent rescue and restoration, standardized archiving, creative revitalization and dissemination, and quantitative effectiveness evaluation of endangered remains of red music. It can not only strengthen the digital protection foundation of red culture, but also break down communication barriers for young audiences, continuously enhance social cohesion from the three dimensions of emotion, value, and identity, and provide solid theoretical and practical support for the digital transformation of red culture and the construction of social spiritual communities.

B. FUTURE OUTLOOK

Subsequently, Transformer big model, digital twin, and metaverse technology can be integrated to build an immersive virtual exhibition hall for red music and an AI interactive platform for studying red songs; Continuously optimizing small sample CNN training algorithms to enhance the activation and protection of red folk songs in niche areas; Further breaking down the barriers to interconnectivity of national red music digital resources, making convolutional neural networks the core technical support for inheriting red genes, consolidating national strength, and fostering cultural confidence.

AUTHOR CONTRIBUTIONS

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The authors declare no conflict of interest.

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