AI-powered Transformation of Hakka Folk Songs into Jazz Style with Piano Integration

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Abstract: Under the trend of globalization, the mutual penetration and coordinated development of Chinese and Western cultural elements are an important trend in the innovation and development of music. After jazz entered China, Chinese composers integrated it with Chinese elements, forming a unique and infectious artistic form. However, according to a CNKI search, no researcher has yet achieved the jazz-style transformation of Hakka folk songs. In view of this, this paper will use the piano as a carrier to analyze the jazz-style transformation and piano integration path of Hakka folk songs empowered by AI, hoping to provide some reference and inspiration for relevant researchers or practitioners.
***Keywords*:** Hakka folk songs, artificial intelligence, piano fusion

1. Theoretical basis for the fusion of jazz and China's traditional music

In academic platforms (China National Knowledge Infrastructure, Wanfang Database, etc.), literature materials with keywords "jazz" + "China music" were reviewed, including 35 journal articles and 47 theses. During the writing process, the author systematically summarized the obtained literature and identified the following four papers with reference value.

For example, literature 1 illustrates that the ethereal quality of fourth-stack chords is highly consistent with the openness of the China pentatonic scale [1]. Literature 2 further analyzes the harmonic tension and modal relationship in modern jazz, emphasizing that extended chords (such as 9th and 11th notes) can enhance the coloration of music, which complements the linear melodic thinking of Hakka folk songs [2]. Additionally, literature 3 shows that both China ethnic music and jazz place great emphasis on freedom and improvisation in rhythm [3]. Literature 4 indicates that the aesthetic beauty of free rhythm and cold jazz is remarkably similar [4]. These literatures provide a theoretical foundation for AI-assisted style transformation.

2. Technical Path and Implementation Method of AI Empowerment

2.1 Feature analysis

The Hakka folk songs and jazz music share similarities yet exhibit distinct differences. Machine learning algorithms can be employed to analyze extensive musical data, comparing melodic patterns in Hakka folk songs with harmonic structures and rhythms in jazz. By identifying overlapping elements, these algorithms generate innovative musical compositions. However, contrasting emotional tones in different pieces—such as blending sorrow and joy in a single piece — may create dissonance that compromises the listener's aesthetic experience. The key technical challenge lies in maintaining stylistic consistency across the entire piano composition. Machine learning algorithms can analyze emotional nuances within musical works, effectively integrating music that shares similar emotional expressions.

Here are a few machine learning algorithms that are widely used and have proven results.

(1) Decision Trees. By constructing a tree-like structure, decision trees classify or regress data from Hakka folk songs or jazz music based on features. For instance, music can be categorized into different styles using characteristics like pitch and rhythm. They are easy to understand and implement, making them suitable for processing structured data. However, their ability to handle complex musical data is limited, and they are prone to overfitting.

(2) Support Vector Machine (SVM). SVM classifies music data by identifying an optimal hyperplane. For instance, it categorizes music based on emotional attributes like happiness or sadness. Widely used in music sentiment analysis and style classification, SVM effectively analyzes a song's emotional tone to determine whether it's cheerful or melancholic. Its strong performance in high-dimensional spaces makes it particularly suitable for processing nonlinear data.

2.2 Style conversion model

To achieve jazz-style transformation of Hakka folk songs, CycleGAN or Transformer models are predominantly employed. CycleGAN, formally known as CycleGAN (CycleGAN), is a generative adversarial network that has achieved

remarkable success in image style transfer. Composed of two generators and two discriminators, it learns mapping relationships between different musical styles, enabling the conversion of Hakka folk songs into jazz. Transformer models serve as another approach for music style transfer, focusing on learning timbre characteristics and applying them to style transfer. In Timbretron, audio signals are first converted into CQT spectrograms, then processed by convolutional neural networks.

3. Specific methods of jazz style transformation of Hakka folk songs

3.1 Harmonic adaptation and color enhancement

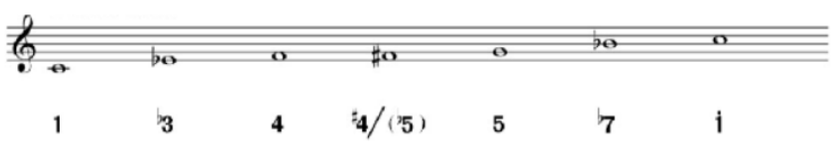
The traditional harmony of Hakka mountain songs is mainly based on triads, with relatively simple harmonic language. When transforming into jazz style, the style conversion model in machine learning algorithms can be fully utilized to achieve modernized re-creation of harmonies. The AI system first extracts and classifies the modal skeleton of mountain song melodies using decision tree algorithms, and then generates harmonic configurations that retain the characteristics of pentatonic modes while incorporating jazz elements. For example, replacing traditional Gong mode harmonies with fourth-stack chords creates ethereal harmonic effects that resonate with modern jazz while aligning with the artistic conception of China's traditional music. Meanwhile, the AI can intelligently generate jazzified substitute chords such as second-degree diminished fifth chords, and validate their emotional consistency through support vector machine algorithms to ensure they match the overall mood of the piece.

3.2 Rhythm reconstruction and rhythm injection

The seemingly contradictory free rhythm of Hakka folk songs and the structured beats of jazz can be creatively transformed through machine learning-based rhythm analysis. The AI model first employs decision tree algorithms to analyze and categorize the free beats of these folk songs, extracting their inherent rhythmic patterns. These patterns are then intelligently mapped into the twelve-beat rhythm system of jazz. This transformation process fully considers the rhythmic compatibility between the two musical forms. By introducing accent shifts and syncopated rhythms, the model enhances the musical dynamism while preserving the rhythmic characteristics of Hakka folk songs.

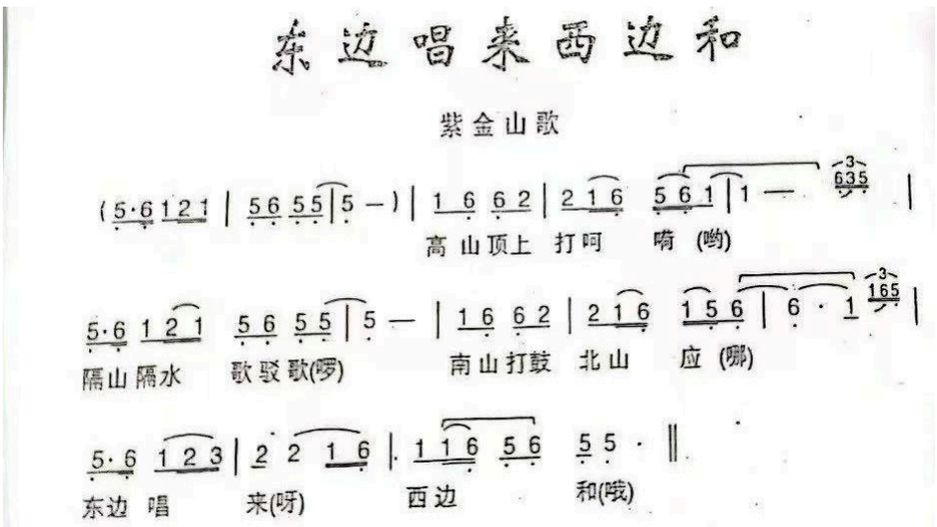
3.3 Melodic improvisation and scale fusion

The jazzification of melodies serves as the pivotal element in stylistic transformation, requiring advanced AI-based improvisation systems. This system employs a deep learning-driven style conversion model that intelligently integrates jazz scales (such as blues scales and whole-tone scales) with the pentatonic scales of Hakka folk songs. The methodology involves preserving the melodic framework of the folk song while introducing jazz chromatic notes (e.g., b3, b7), thereby infusing traditional melodies with the blues 'distinctive melancholic quality (as demonstrated in Example 1). Throughout this process, decision tree algorithms ensure these variations maintain the folk song's inherent narrative flow and melodic structure.

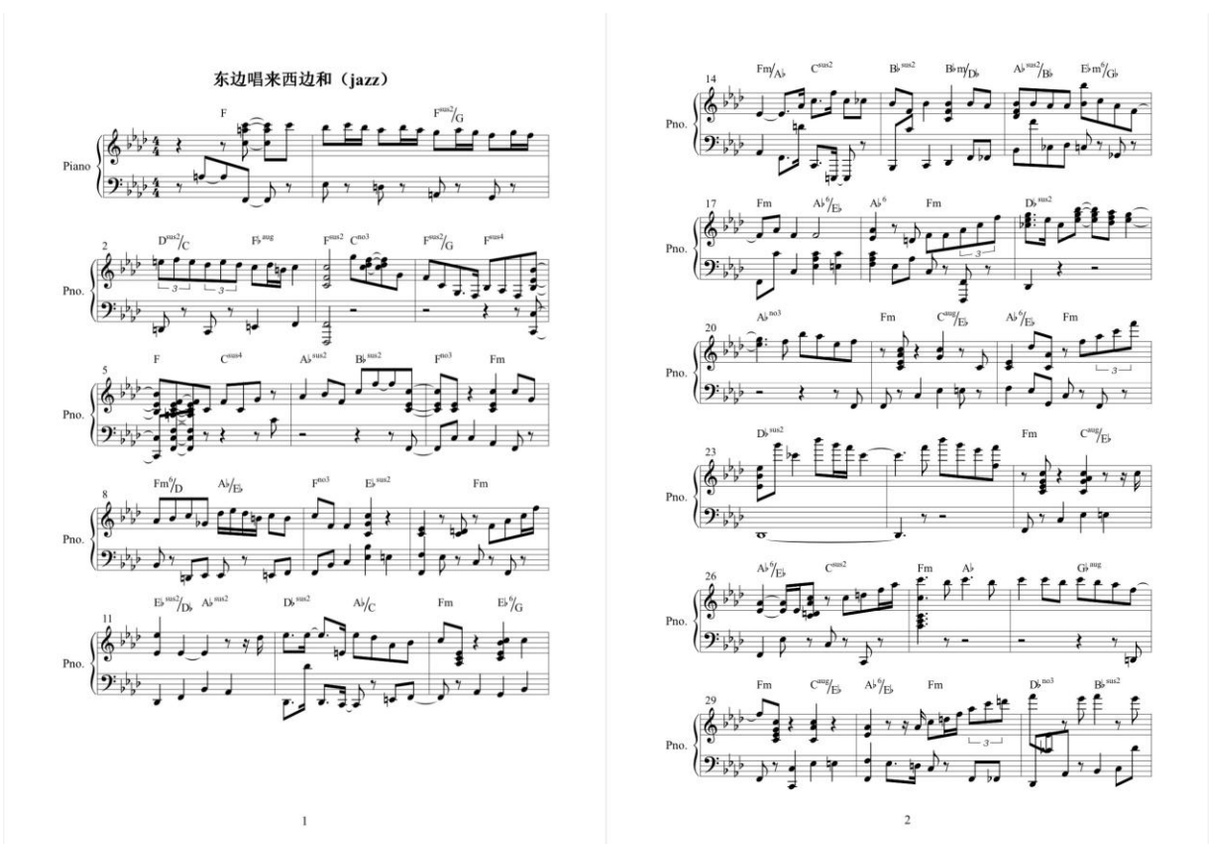


Example 1

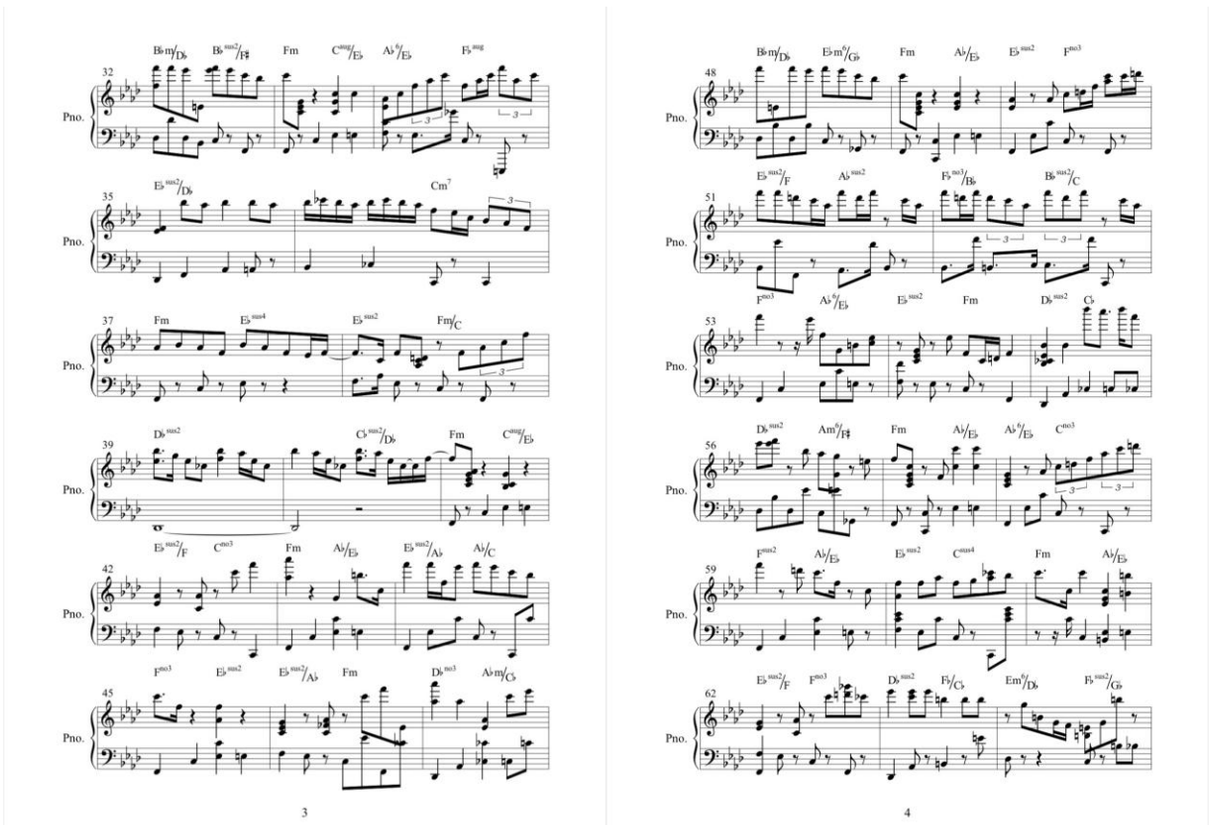
This case study examines the creative process of Zijinshan's song "Dongbian Chang Lai Xi Bian He" (see Example 2). The melody was initially generated by Suno AI, then professionally processed using Capella Audio2Score Pro 5 to convert the audio file into corresponding visual notation (see Examples 3, 4, 5, and 6).



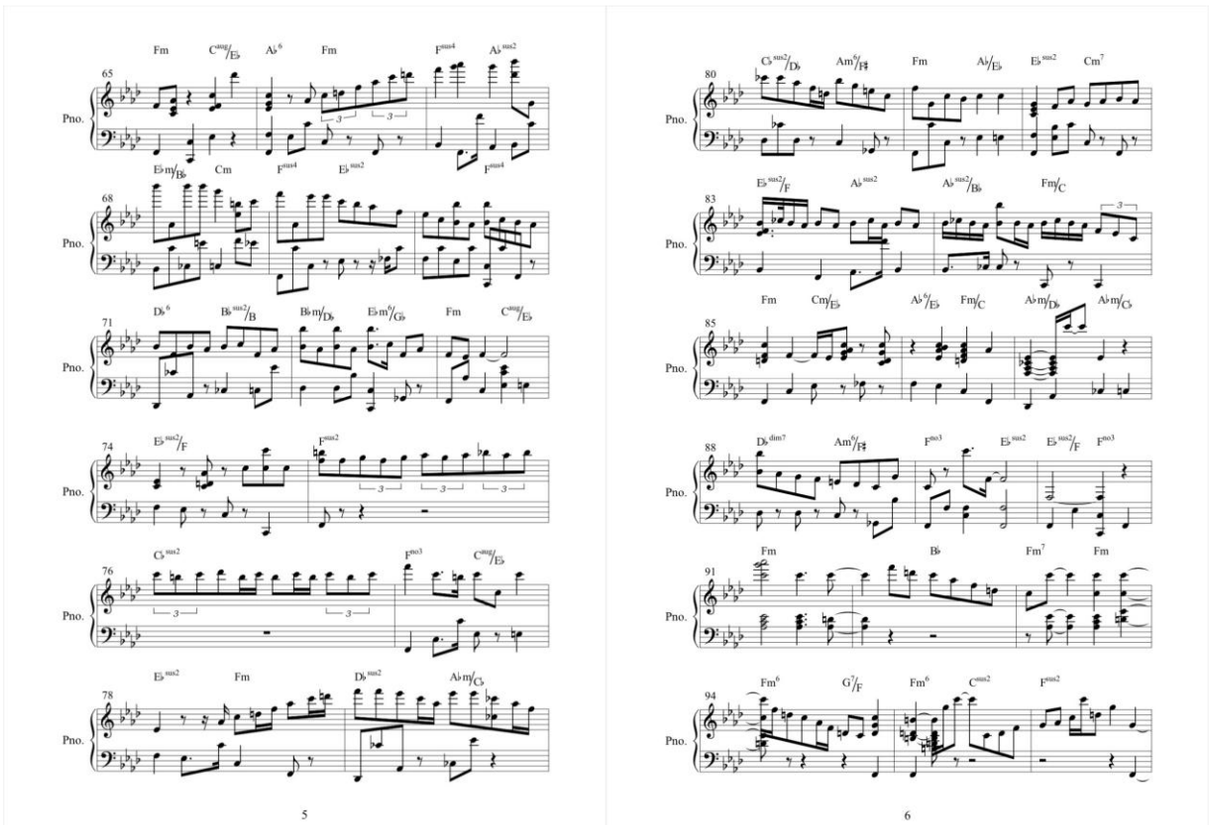
Example 2



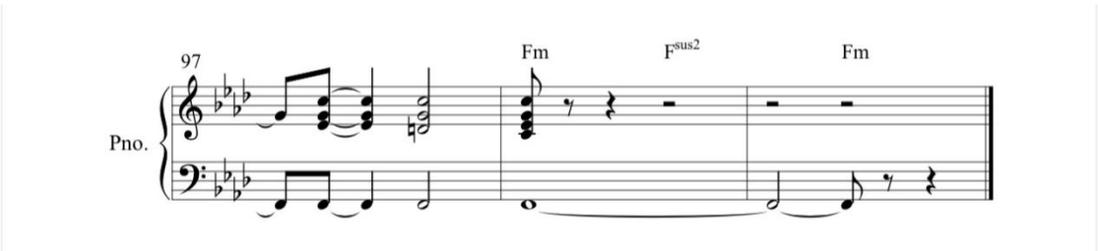
Example 3



Example 4



Example 5



Example 6

4. Conclusion

In conclusion, as a cutting-edge information technology with formidable computational power, artificial intelligence (AI) offers an efficient and innovative approach to transform Hakka mountain songs into jazz-infused piano compositions. This revitalizes this ancient art form, expanding its artistic boundaries and enhancing its emotional resonance. However, it's crucial to recognize that when evaluating music's humanization, emotional depth, and communicative power, AI-generated music still falls short compared to human composers and performers.

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