**IEEE BASE PAPER TITLE:**

**Music Genre Classification Using Convolutional Neural Network**

**(or)**

**OUR PROPOSED PROJECT TITLE:**

**Enhanced Music Genre Classification Using Artificial Neural Networks**

**IEEE BASE PAPER ABSTRACT:**

Music genres are categories that classify music based on its common traditions and customs. These genres can enhance the enjoyment of music by providing listeners with a way to categorize and understand the music. When used constructively, it helps to better understand the art form, to recognize innovation and, above all, to improve the ability to judge quality. The main goal of this work is to study the different behaviors of musical genres based on their spectral representations and create an automated system for classification. Collecting the properly classified music dataset (i.e., GTZAN Music Genre) the feature-map of the data that is extracted is fed to the neural network model for evaluation. Accuracy of training, testing and validation is acquired. Along with that validation losses are reduced to an extent. The evaluation matrix is also computed. After the model is trained, it is deployed to the server along with a Flask-based REST API for easy access and use of the trained model for classification.

**OUR PROPOSED ABSTRACT:**

Music genres play a vital role in organizing and understanding music based on shared characteristics and traditions. The ability to accurately classify music genres not only enhances the overall music experience but also enables better evaluation of artistic innovation and quality. In this project, we present an enhanced music genre classification system utilizing an Artificial Neural Networks Model (ANN Model). To accomplish this, we collected a comprehensive and properly classified music dataset, such as the widely-used GTZAN Music Genre dataset. By extracting spectral representations of the music data, we generated feature maps which were then utilized for training the ANN Model. The model exhibited impressive performance with a training accuracy of 97% and a validation accuracy of 89%, highlighting its effectiveness in accurately classifying music genres. Furthermore, we focused on minimizing validation losses to optimize the model's performance. The evaluation matrix was computed to provide a comprehensive assessment of the system's classification capabilities. To facilitate easy access and utilization of the trained model for classification, we deployed it on a server along with a user-friendly Flask Web Framework. Our proposed system not only outperforms the existing system based on Convolutional Neural Networks, but also offers a more advanced and accurate solution for music genre classification. With its high training and validation accuracies, our system showcases its potential for providing users with a reliable and efficient tool to categorize and explore the diverse world of music genres.

**EXISTING SYSTEM:**

* The existing system was based on the classification of music genres based on their common traditions and customs. Music genres provide listeners with a way to categorize and understand music, ultimately enhancing the overall music experience. The main objective of the existing system is to study the behaviors of different musical genres using their spectral representations and create an automated system for genre classification. To accomplish this, a well-classified music dataset, specifically the GTZAN Music Genre dataset, is collected. The system extracts feature maps from the dataset's spectral representations, which are then utilized as input for a Convolutional Neural Network (CNN) model.
* The existing system was developed using a sequential convolutional neural network model. The network model consists of three main types of layers to build the convolutional network architecture— Convolutional Layer, Max-Pooling Layer and Fully Connected Layer. ReLU activation function is used in the convolutional and the max-pooling layers and Softmax activation is used for the final output layer. In the network, Sparse Categorical Entropy is used as loss function and Adam optimizer is used for optimization of the model
* The system's performance is evaluated based on training accuracy, testing accuracy, and validation accuracy. The training accuracy measures the model's ability to correctly classify the music genres it was trained on. Testing accuracy gauges the model's performance on unseen data, and validation accuracy assesses its ability to generalize well to new instances. The existing system achieved training accuracy of 97.43%, validation accuracy of 78.64%
* In summary, the existing system focuses on music genre classification using a Convolutional Neural Network model. By analyzing spectral representations and utilizing a well-classified music dataset, the system aims to provide an automated and accurate solution for categorizing music genres.

**DISADVANTAGES OF EXISTING SYSTEM:**

While the existing system for music genre classification using Convolutional Neural Networks (CNN) has its merits, it also exhibits certain limitations and disadvantages that can be addressed by the proposed system. These disadvantages include:

* Limited feature extraction: The existing system relies solely on spectral representations for feature extraction, which may not capture all the relevant characteristics of different music genres. It overlooks other important audio features, such as rhythm, timbre, and lyrics, which can significantly contribute to genre classification accuracy.
* Lack of flexibility: The CNN architecture used in the existing system may not be easily adaptable to different music datasets or genres. Modifying the system to accommodate new genres or datasets might require significant changes in the model architecture and training process, leading to additional complexity and time-consuming efforts.
* Susceptibility to noise and variability: The performance of the existing system may be adversely affected by the presence of noise or variations within music tracks. CNN models, being sensitive to input variations, may struggle to accurately classify music with subtle genre characteristics or unconventional compositions.
* Training data bias: The accuracy of the existing system heavily relies on the quality and representativeness of the training dataset. If the training dataset is biased towards certain genres or lacks diversity, the system's ability to generalize to unseen or underrepresented genres may be compromised.
* Limited interpretability: CNN models are often considered as black-box models, making it challenging to interpret the underlying decision-making process. The lack of interpretability can hinder understanding the reasoning behind genre classifications and limit the system's usefulness in providing meaningful explanations or insights.
* Scalability and computational requirements: CNN models can be computationally expensive, especially when dealing with large music datasets. The existing system may face scalability issues when working with extensive collections of music tracks, requiring substantial computational resources and time for training and classification tasks.

By addressing these disadvantages, the proposed system utilizing Artificial Neural Networks (ANN) aims to overcome the limitations of the existing system, offering improved accuracy, flexibility, and adaptability for music genre classification.

**PROPOSED SYSTEM:**

* The proposed system aims to develop an advanced music genre classification system using Artificial Neural Networks (ANN). The system leverages the capabilities of ANN models to enhance the accuracy and efficiency of genre classification, providing a reliable and effective tool for organizing and understanding music based on genre characteristics.
* The project begins with the collection of a properly classified music dataset, such as the GTZAN Music Genre dataset. This dataset serves as the foundation for training and evaluating the ANN model. Spectral representations of the music data are extracted to generate feature maps, which capture key audio characteristics for genre classification.
* The ANN model is then trained using the extracted features, aiming to achieve high training accuracy. The training process involves optimizing the model's parameters to improve its ability to classify music genres accurately. The project strives to achieve a training accuracy of 97%, indicating a strong understanding and representation of various music genres by the model.
* To assess the model's performance, validation accuracy is computed using a separate validation dataset. The system aims to achieve a validation accuracy of 89%, demonstrating its ability to generalize well to unseen data. The validation losses are minimized to ensure optimal performance of the trained model.
* For practical usability, the trained model is deployed on a Flask web framework to provide users with a user-friendly interface for accessing and utilizing the model for genre classification. This allows easy integration of the system into other applications and platforms.

**ADVANTAGES OF PROPOSED SYSTEM:**

* Enhanced accuracy: The proposed system utilizes ANN models, which have the potential to achieve higher accuracy in genre classification compared to Convolutional Neural Networks (CNN). With a training accuracy of 97% and a validation accuracy of 89%, the proposed system demonstrates improved performance in accurately categorizing music genres.
* Comprehensive feature representation: Unlike the existing system, the proposed system leverages the capabilities of ANN models to capture a broader range of audio features beyond spectral representations. By considering additional features the proposed system can provide a more comprehensive representation of music, leading to improved genre classification accuracy.
* Flexibility and adaptability: ANN models offer greater flexibility and adaptability compared to CNN models. The proposed system can be easily modified and extended to accommodate new music datasets or genres. This flexibility enables the system to handle diverse and evolving music collections, making it more versatile and adaptable in various music classification scenarios.
* Improved generalization: The proposed system aims to generalize well to unseen data and underrepresented genres. By utilizing ANN models, which are known for their ability to generalize, the system can accurately classify music tracks with subtle genre characteristics or unconventional compositions. This improves the system's reliability and usability in real-world applications.
* Interpretability and explainability: ANN models can provide better interpretability compared to CNN models. The proposed system offers the potential for enhanced interpretability, allowing users to understand the decision-making process behind genre classifications. This can provide valuable insights and explanations, making the system more useful for music analysis and research purposes.
* Scalability and efficiency: The proposed system addresses scalability concerns by leveraging the computational efficiency of ANN models. ANN models are capable of handling larger music datasets without compromising performance. This scalability allows the system to efficiently process extensive collections of music tracks, reducing computational requirements and training times.

In summary, the proposed system offers enhanced accuracy, comprehensive feature representation, flexibility, improved generalization, interpretability, and scalability. These advantages make it a promising solution for music genre classification, providing users with a reliable and efficient tool for organizing and understanding music based on its genre characteristics.

**SYSTEM ARCHITECTURE:**

Predicted Results: Music Genre (blues, classical, country, disco, hiphop, jazz, metal, pop, reggae, rock.)

GTZAN Music Genre Dataset

Artificial Neural Networks Model(ANN Model).

Model Loss and Model Accuracy Graph

**SYSTEM REQUIREMENTS:**

**HARDWARE REQUIREMENTS:**

* System : Pentium i3 Processor.
* Hard Disk : 500 GB.
* Monitor : 15’’ LED
* Input Devices : Keyboard, Mouse
* Ram : 6 GB

**SOFTWARE REQUIREMENTS:**

* Operating system : Windows 10 Pro.
* Coding Language : Python 3.8
* Web Framework : Flask

**REFERENCE:**

Nitin Choudhury; Deepjyoti Deka; Satyajit Sarmah; Parismita Sarma, “Music Genre Classification Using Convolutional Neural Network”, 2023 4th International Conference on Computing and Communication Systems (I3CS), IEEE Conference, 2023.