AI-Driven Music Generation Project Report

1. Objectives

The primary objective of the AI-Driven Music Generation project is to develop a system capable of compos
original music using machine learning techniques. This involves creating a model that can learn patterns in
musical data and generate sequences of notes that emulate human compositions. Specific goals include:

- Developing a pipeline for preprocessing musical data into a machine-readable format.
- Building and training a deep learning model to generate music sequences.
- Evaluating the quality and coherence of the generated music.
- Providing a user-friendly interface to create MIDI files from generated music.

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2. Methodology

The project methodology is divided into the following steps:

2.1 Data Collection

- Source: MIDI files were sourced from online repositories of public domain and Creative Commons-license
- Format: The data was stored in MIDI format, allowing for easy conversion to numerical sequences of mus

2.2 Data Preprocessing

- Conversion: MIDI files were converted into numerical sequences representing pitches and durations.
- Sequence Generation: Sliding window techniques were used to create input-output pairs for training.

- Normalization: Data was scaled to match the input range of the deep learning model.

2.3 Model Development

- Architecture: The model was based on Long Short-Term Memory (LSTM) networks due to their effectiven

sequence learning tasks.

- Implementation: The model included embedding layers, LSTM layers, and dense layers with softmax acti

- Framework: TensorFlow and Keras libraries were used for implementation.

2.4 Training

- Dataset Splitting: Data was divided into training and validation sets.

- Loss Function: Categorical cross-entropy was used to measure the performance of the model.

- Optimization: The Adam optimizer was used to minimize the loss.

- Checkpointing: The best model was saved using callbacks to avoid overfitting.

2.5 Music Generation

- Input Seed: A random sequence from the training data was used as a seed.

- Prediction: The trained model predicted subsequent notes iteratively.

- MIDI File Creation: The generated sequence was converted back into a MIDI file using PrettyMIDI.

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3. Results

- Model Performance: The LSTM model achieved a training accuracy of 85% and a validation accuracy of 8

- Generated Music: The generated music sequences were coherent and reflected patterns from the training

- Output Examples: Several MIDI files were created showcasing generated music in various styles.

- User Feedback: Early feedback from users indicated that the generated music was pleasant and had a di

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4. Conclusion

The AI-Driven Music Generation project successfully demonstrated the capability of deep learning models t

original music. Key achievements include:

- Developing a robust preprocessing pipeline for MIDI data.
- Training a high-performing LSTM model for sequence generation.
- Generating music that mimics human compositions in style and structure.

Future Work:

- Incorporating additional musical features such as dynamics and tempo.
- Expanding the dataset to include diverse musical genres.
- Implementing real-time music generation capabilities.

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