Hip Hop Rap Lyric Generator with GPT-J Model and Multi-Task Learning

1. Introduction:
This proposal outlines a capstone project to develop a Hip Hop Rap Lyric Generator using a fine-tuned GPT-J model from Hugging Face. The goal is to create an AI-powered tool that generates rhyming couplets with proper meter, capturing the essence of Hip Hop music. The dataset will be collected from Rap Genius using the Lyrics Genius API, and preprocessing will involve grapheme-to-phoneme conversion and rhyme filtering. The project will also incorporate multi-task learning, allowing the model to learn lyric generation, phoneme-to-grapheme conversion, and grapheme-to-phoneme conversion simultaneously. The project will culminate in a Flask application where users can input a starting lyric and receive creatively generated rap lyrics.

2. Objectives:
a) Data Collection and Preprocessing:
- Gather rap lyrics data from Rap Genius using the Lyrics Genius API.
- Clean and preprocess the data, applying grapheme-to-phoneme conversion to enable the model to understand meter and rhythm.
- Use the Rhyme API to filter the dataset into rhyming couplets.

b) Fine-tuning GPT-J Model with Multi-Task Learning:
- Implement multi-task learning to enable lyric generation and phoneme-grapheme conversions.
- Train the GPT-J model on the preprocessed data to improve rhyme and meter understanding.

c) Flask Application Development:
- Create a user-friendly Flask web application for generating rap lyrics.
- Integrate the fine-tuned GPT-J model with multi-task learning into the application.
- Deploy the application on a web server for user access.

3. Implementation Strategy:
Phase 1: Data Collection and Preprocessing
- Access the Lyrics Genius API to gather rap lyrics data from Rap Genius.
- Preprocess the data by converting graphemes to phonemes for improved meter understanding.
- Use the Rhyme API to filter and extract rhyming couplets from the dataset.

Phase 2: Fine-tuning GPT-J Model with Multi-Task Learning

- Prepare the GPT-J model for fine-tuning with the preprocessed rap lyric dataset.
- Enable multi-task learning for lyric generation and phoneme-grapheme conversions.
- Train the model on the data to enhance rhyme and meter understanding.

Phase 3: Flask Application Development
- Create a user-friendly Flask web application for generating rap lyrics.
- Integrate the fine-tuned GPT-J model with multi-task learning into the application.
- Deploy the application on a web server for user access.

4. Evaluation and Success Metrics:
a) Rhyme Accuracy: Measure the percentage of generated lyrics that successfully rhyme with the user input.
b) Meter and Flow: Assess the coherence of the generated lyrics' meter and flow compared to professional rap lyrics.
d) User Feedback: Gather user feedback to evaluate overall satisfaction with the generated lyrics.

5. Deployment:
The final model with multi-task learning will be integrated into a Flask application and deployed on a web server. Users can input a starting lyric, and the application will generate rap lyrics based on the fine-tuned GPT-J model's output.

6. Conclusion:
This capstone project aims to create a Hip Hop Rap Lyric Generator using a fine-tuned GPT-J model with multi-task learning. By incorporating grapheme-to-phoneme conversion and rhyme filtering, the model will generate rhyming rap lyrics with a coherent flow, capturing the essence of Hip Hop music. The Flask application will offer a user-friendly platform for experiencing AI-generated Hip Hop music. The successful implementation will demonstrate the power of machine learning in artistic expression and natural language generation.