Project Summary:

The goal of this project is to develop an AI model that generates short musical compositions based on specified themes or emotions (e.g., happy, sad, relaxed, tense). By training on a dataset of musical pieces labeled by emotion, the AI composer will learn to associate certain musical features (like tempo, key, and chord progressions) with emotional tones. This could be useful for soundtracking short videos, games, or even providing therapeutic music.

Research Plan:

1. **Data Collection**:
    - Source a labeled music dataset with emotion annotations (e.g., from the GTZAN dataset or an emotion-labeled subset of MIDI files).
    - Preprocess the music data to simplify it to key features, such as melody lines and chord progressions, for training the model.
2. **Model Development**:
    - Experiment with models like Recurrent Neural Networks (RNNs) or Transformers tailored for sequential data, specifically models like LSTM or Music Transformer.
    - Implement a conditional generator that takes in an “emotion” label and outputs a music sequence that reflects that emotion.
3. **Training and Fine-Tuning**:
    - Train the model to generate coherent music sequences, tuning hyperparameters to balance structure and randomness in the compositions.
    - Use additional fine-tuning with user or expert feedback to enhance the emotion consistency of generated pieces.
4. **Evaluation**:
    - Evaluate compositions based on subjective metrics, like user feedback on how well the music matches the target emotion.
    - Conduct an analysis of generated music structure (e.g., chord use, tempo) to assess if it aligns with typical emotional cues.
5. **Presentation**:
    - Showcase a few generated music samples for each emotion and present feedback results to evaluate success.

Tech and Data Requirements:

- **Tools**: PyTorch/TensorFlow, Jupyter/Colab, a MIDI music library for preprocessing, and potentially libraries like Magenta for music processing.
- **Dataset**: Emotion-labeled music data, possibly from MIDI or other accessible music datasets.

Risks and Fallbacks:

- **Risks**: Emotional mapping might be challenging, especially with limited data.
- **Fallbacks**:
    - Simplify by focusing on two or three distinct emotions.
    - If complex melodies prove too challenging, start with simpler sequences or loops for ambient sounds.