AUDIO CRAFT

MUSICGEN

AI MUSIC GENERATION

AUGUST 2023

RAGACRAFT AI MUSIC

AudioCraft 24-hours Hackathon

-Wednesday, August 30 2023 - 12:00 PM America/New_York

-By Lablabai

Introduction to Raga in AI Music Generation

INTRODUCTION TO RAGA

- Raga: The melodic framework of Indian classical music.
- Provides a platform to compose music with distinctive emotional landscapes.
- Can evoke emotions ranging from joy, romance to devotion.
- Examples: Hindol, Todi

COMPLEXITY IN AI MUSIC COMPOSITION

- Use of 'shrutis': Microtonal intervals smaller than semitones in Western music.
- 'Gamakas': Expressive nuances and timing variations.
- Improvisational essence: Varies across performances.
- Time or season-specific Ragas.
- 'Talas': Intricate rhythmic structures with unique nuances.

Significance of Raga & Current Challenges

RAGA'S SIGNIFICANCE

- Foundation of Indian classical music.
- Each Raga encapsulates a mood, story, and rules for progression.
- Can alleviate despair and induce happiness.
- Example: Raga Hindola aids in memory sharpening.

RAGACRAFT'S BACKEND
RAGA SELECTOR DATASET

Raga and emotions – sample dataset

Raga Name	Mood/Evocation
Abhogi	Devotion, Peace
Amritavarshini	Rainy, Pleasant
Anandabhairavi	Soft, Devotional
Bhairavi	Devotion, Pathos
Hamsadhwani	Joy, Celebration
Kalyani	Majestic, Divine
Keeravani	Devotion, Solemnity
Mohanam	Sweetness, Joy
Ritigowla	Devotion, Yearning

TWO BRANCHES OF INDIAN CLASSICAL MUSIC

- Emotion/Mood – raga selection example from Carnatic Ragas or Hindustani Ragas

Devotion	Abhogi	Bhairav
Peace/Serene	Shankarabharanam	Bhoop, Yaman
Joy/Celebration	Hamsadhwani	ShudhSarang
Romantic/Yearning	Madhuvanti	Kamboji, Khamaj

SIGNIFICANCE OF RAGA & CURRENT CHALLENGES

The Problem Addressed

In our research, we found the below problems when using audiocraft:

- Low audio quality
- Biases in training data on music generation websites - audiocraft is not focused to generate cross-cultural music generation such a raga. It needs detailed prompting.
- Customer is normally not well-equipped to render a technical prompt that describes the complex raga structure / song.
- Difficulty to create a prompt that accuractely select a raga based on the mood.

Solutions &

OUR ROLE

- Research Raga and its features.
- Develop a raga and emotions dataset based on published research.
- Generate a detailed prompt from customer input.
- Fine-tune audiocraft with a selected raga dataset (In progress).
- Pass the detailed prompt to audiocraft, generate a song for the customer.

SIGNIFICANCE OF
PROMPT ENGINEERING

Our contribution

In this hackathon:

- Researched raga music and its features.
- Researched audiocraft, musicGEN and its features.
- Investigated the MusicGEN model on its raga based songs generation.
- Created a dataset linking Ragas with associated emotions.
- Developed a model that processes customer input and delivers a generated song to the UI.

SIGNIFICANCE OF
PROMPT ENGINEERING

Our Model

- Developed a program capable of processing customer raw input.
- Implemented a program to select a raga from our extensive database.
- Utilized the OpenAI API to generate a comprehensive and detailed prompt.
- Employed the audiocraft model to translate the prompt into audio output.
- Facilitated the retrieval of the generated audio file, subsequently presented for customer download via the user interface (UI).

BUILDING TECHNICAL PROMPT FOR AUDIOCRAFT

Input / Output prompt development Examples

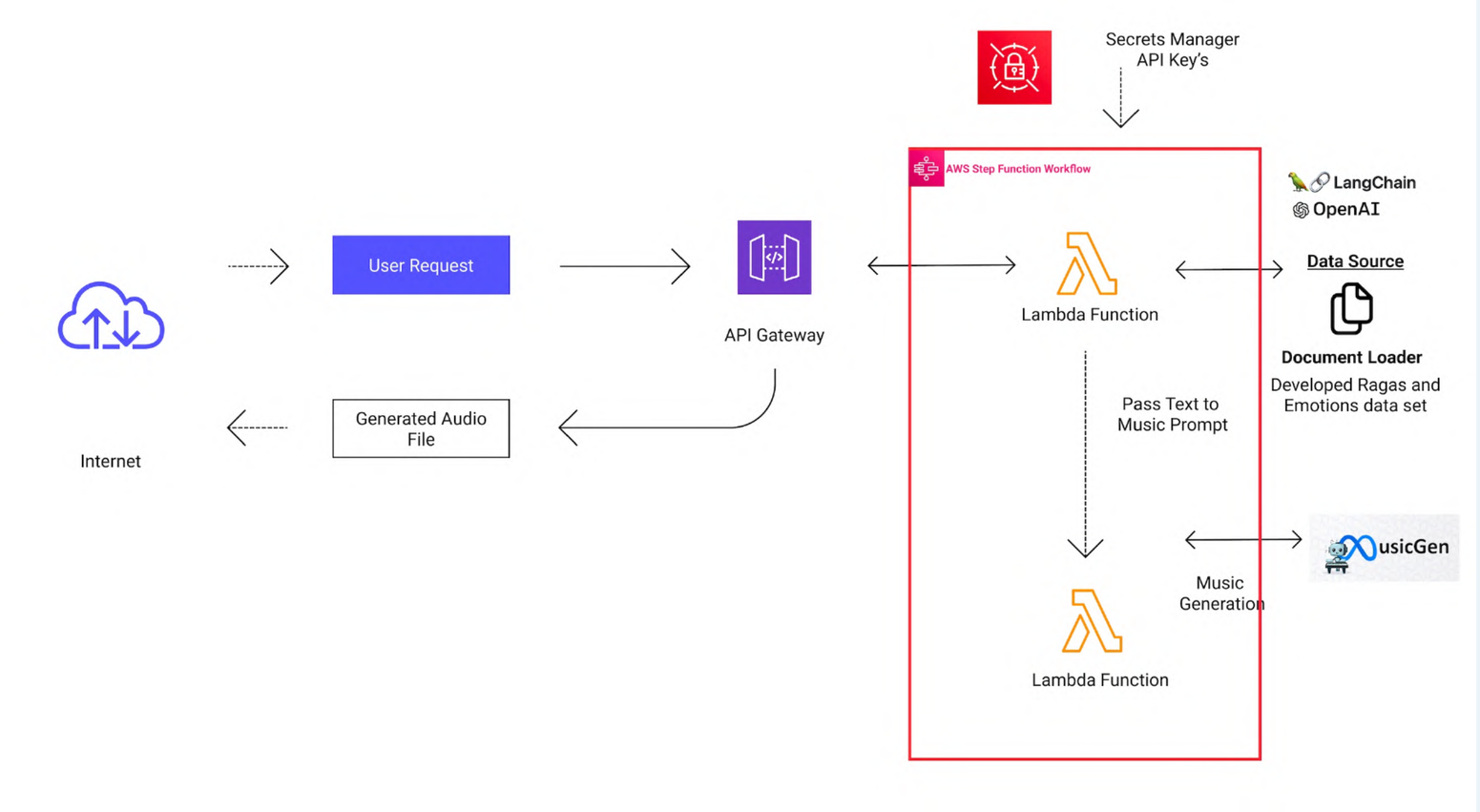
- **Customer raw input: "I am feeling romantic today. It is valentines day. I like to generate a suitable song."**
- **Ragacraft to OPENAI: "** Generate a text to music prompt for single romantic raga, include several relevant parameters such as tempo, scale, pitch, rhythm, dynamics, texture, timbre, etc. for an optimized romantic mood. Specify suitable alues for each of these features from your knowledge and include in the prompt generated. Make it in 50-100 words. This prompt is given as a prompt to ai music generator musicgen"
- **OpenAI to RagaCraft: ""**"For a romantic mood, let's use the Hindustani raga Kamboji. The tempo should be medium to slightly slow, and the scale should be major. The pitch should be mostly high and bright, but with some low notes to give a sense of depth. The rhythm should be relaxed and gentle, with a 4/4 time signature. Dynamics should be varied, with some crescendos and decrescendos. Texture should be light and airy, and timbre should be gentle and smooth. Let's generate a romantic piece of music in Kamboji that captures the beauty and emotion of love."

Ragacraft Pipeline

PIPELINE DEVELOPED SPECIFIC TO RAGA MUSIC GENERATION

- Customer provides input.
- JavaScript (JS) is used to select the appropriate raga.
- Prompt request is sent to the API.
- API-generated prompt is forwarded to Audiogen.
- Audiogen processes the prompt and produces a song.
- The generated song is delivered back to the customer.

Ragacraft Pipeline – Visual



This is a high-level overview of your company’s long-term mission. What's the solution you will be offering in future?

IN PROGRESS RESEARCH AND DEVELOPMENT WORK IN THIS HACKATHON

RMMM – RagaCraft Training Pipeline

BUILDING THE FINE-TUNING BASED ON AUDIOCRAFT TRAINING PIPELINE

- AudioCraft's core component, the solver, processes the raga dataset.
- Training logic integrates datasets, models, optimization, and a full loop.
- Utilization of epochs ensures safety and efficiency.
- Models employ torch modules to interpret raga data.

Building the Foundation based on Audiocraft Training Pipeline

RMMM - AUDIOCRAFT TRAINING PIPELINE

- Synchronization between encoder modules, quantization bottlenecks, and decoders.
- RagaCraft integrates Audiocraft Dora for experiment management.
- Dora assists with hyperparameter management across tasks.
- The model processes and outputs multi-track raga-based music.

THE FUTURE –
MIDI AND REFINEMENT

Beyond Today's RagaCraft

- MIDI conversion to enhance the raga tracks.
- Convert back to audio for an authentic raga sound.
- Ensuring true raga alignment in outputs through future validation.

CLOSING THOUGHT/ OVERVIEW

RagaCraft's Promise

HIGHLIGHTS

- Bridging ancient Indian music with modern Ragacraft capabilities.
- Serving educational, entertaining, and research purposes.
- A distinctive solution to the hackathon challenge, emphasizing musical diversity.

TEAM

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