Comparative Analysis of Spectrograms for Selected Songs

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1 Introduction

Music spans various genres, each characterized by unique vocal and instrumental patterns. Spectrogram analysis provides a visual representation of the frequency distribution of audio over time. This report presents a comparative analysis of spectrograms for four selected songs from different genres:

- **Tum Hi Ho** (Bollywood Romantic)
- **Om Jai Jagdish Hare** (Devotional Bhajan)
- **Kesariya Balam** (Traditional Rajasthani Folk)
- **Hoshwalon Ko Khabar Kya** (Ghazal)

2 GitHub repository

The complete task can be accessed from this repository. Question2

3 Methodology

The audio of each song was transformed into a spectrogram, visualizing the amplitude of the various frequency components over time. Time is plotted on the x-axis, frequency on the y-axis, and the amplitude is shown by colour intensity in decibels (dB). Remarks were drawn from frequency distribution, intensities, and harmonic patterns.

4 Observations and Comparisons

4.1 Tum Hi Ho (Bollywood Romantic)

- Wide frequency range (128 Hz – 16 kHz)

- Strong vocal prominence with orchestral backing
- Moderate to high percussive impact

4.2 Om Jai Jagdish Hare (Devotional Bhajan)

- Mid-frequency dominance (128 Hz – 8 kHz)
- Steady harmonium and chorus vocals
- Low percussive variation

4.3 Kesariya Balam (Traditional Rajasthani Folk)

- Rich mid-low frequency range (64 Hz – 8 kHz)
- Prominent vocal patterns with traditional instruments
- Moderate percussive impact

4.4 Hoshwalon Ko Khabar Kya (Ghazal)

- Balanced frequency distribution (64 Hz – 16 kHz)
- Soft instrumental transitions and delicate vocals
- Low-intensity variations emphasizing lyrics

5 Comparative Summary

Aspect	**Tum Hi Ho**	**Om Jai Jagdish**	**Kesariya Balam**	**Hoshwalon Ko**
Frequency Range	128 Hz – 16 kHz	128 Hz – 8 kHz	64 Hz – 8 kHz	64 Hz – 16 kHz
Percussion Impact	Moderate to High	Low	Moderate	Low
Vocal Prominence	Strong	Strong (Chorus)	Dominant	Very Strong
Instrumentation	Orchestral	Harmonium, Chorus	Traditional Folk	Soft, Ghazal-style
Emotional Tone	Intense	Devotional	Earthy, Storytelling	Poetic, Calm

Table 1: Comparison of spectrogram characteristics across selected songs.

6 Conclusion

Spectrograms give qualitative descriptions of the distinct acoustic characteristics of various genres: while Bollywood songs like *Tum Hi Ho* show elaborate orchestral structure, devotional bhajans like *Om Jai Jagdish Hare* focus on

closely-knit harmonic progression. Folk music songs like *Kesariya Balam* emphasize strong vocal storytelling, while ghazals like *Hoshwalon Ko Khabar Kya* focus on the sweet touch of lyrics and melody. This comparative analysis effectively demonstrates the contrasts in spectrogram representation of music styles.

7 References

References

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