



A Corpus Study of Rhythm in Brazilian Popular Music

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1. MOTIVATION

- **MPB as a field of study:** Brazilian Popular Music (MPB) is a rich and compelling subject, though systematic studies remain scarce compared to other genres (e.g. concert music)
- **Goal of the MPB Project:** To map stylistic characteristics of Brazilian composers, representative of the MPB aesthetic, through computational and statistical analysis of harmony, melody, and rhythm
- **Temporal scope:** Focused on what we call the *MPB common-practice period* (roughly from 1953 to 1993), corresponding to the creative lifetime of Tom Jobim
- **Study focus:** This paper examines rhythmic structures within a representative corpus of composers and *control-group genres* (*samba*, *choro* and *jazz*)
- **Research questions:**
 - How do rhythmic patterns in MPB differ across its composers?
 - Can computational models effectively capture the stylistic rhythmic characteristics of MPB?

2. THE MPB CORPORA

- **Trends in corpus studies:** Advances in computational technologies and growth of music databases \Rightarrow corpus studies - analysis of various musical styles systematically
- **Position of the MPB Project:** The MPB Project examines multiple corpora grouped into two categories:
 - Primary corpus: Each containing 50 pieces from 10 key MPB composers: Tom Jobim, Ivan Lins, Chico Buarque, Edu Lobo, Caetano Veloso, Djavan, Milton Nascimento, João Bosco, Gilberto Gil, and Rita Lee
 - Control corpus: Genre-based corpora, representing jazz, *samba*, and *choro*, with 50 pieces each
- **Diversity of musical attributes:** The project explores several aspects of rhythm, harmony, and melody, as well as the relation between melody and harmony
 - This paper is focused only on rhythm
- **Melodic Filtering Model:** To encode melody based on:
 - Segmentation: Divides melodies into smaller, self-contained units (phrases), referred to as "words" (Fig. 1)
 - Abstraction: Groups structures into equivalence classes by isolating rhythmic elements from melodic content
 - Encoding: Represents rhythmic onsets within a beat grid using an alphabet of "r-letters" (Fig. 2)
- **Encoding process:** Melodic onsets (disregarding durations) are mapped to specific "r-letters". See an example in Fig. 1
- **Flexibility of the model:** The r-letter alphabet ("a" to "v") covers most rhythmic patterns in popular music. Additional "wildcard" letters are reserved for uncommon or context-specific rhythmic patterns, ensuring adaptability (Fig. 2)

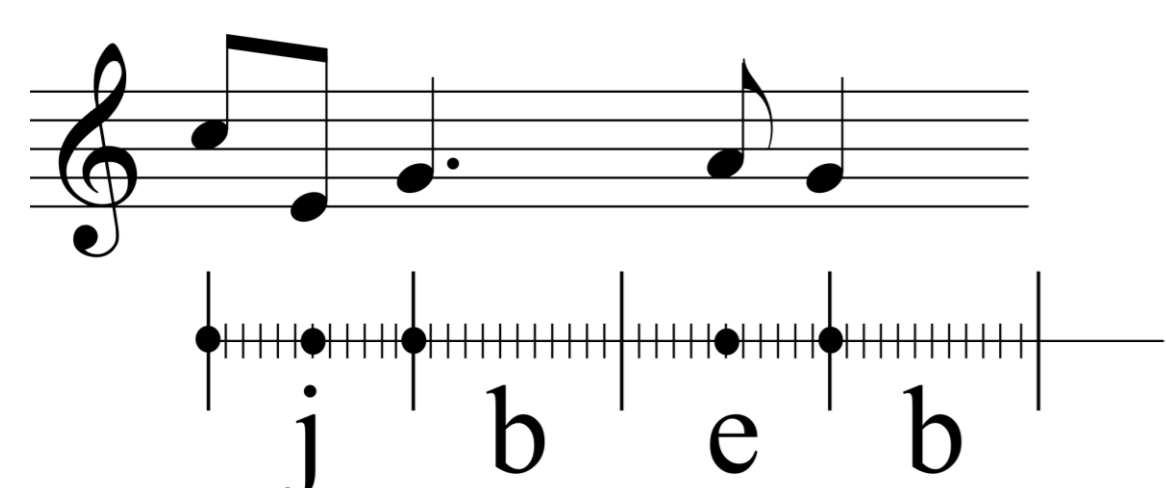


Fig. 1: Example of the encoding of a small melodic segment into r-letters, making the r-word "jbeb". See Fig. 2 for the alphabet of r-letters.

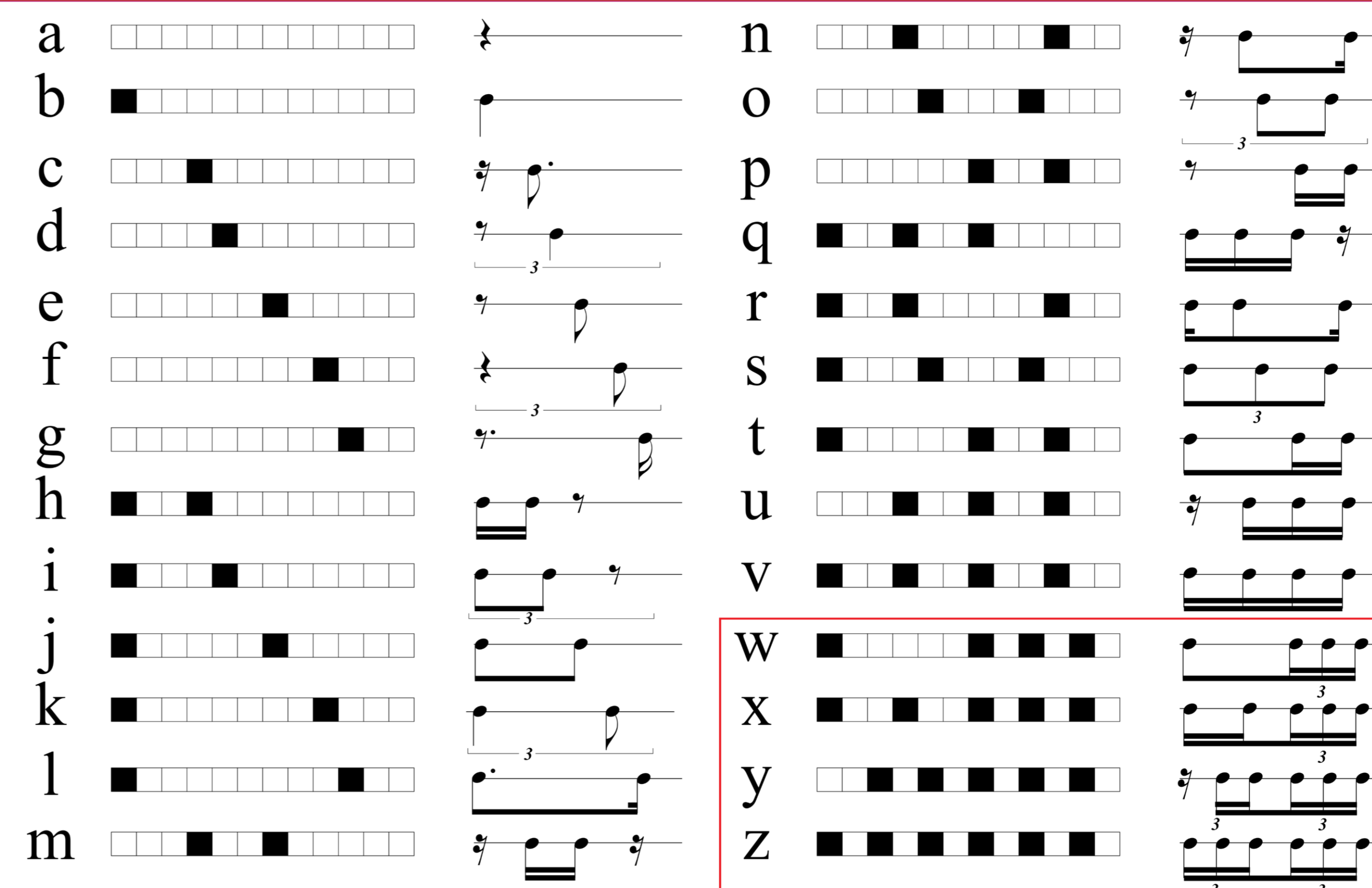


Fig. 2: Alphabet of r-letters used in the Melodic Filtering Model. The last four letters ("w", "x", "y", and "z") are suggestions for possible "wildcard letters".

3. RESULTS

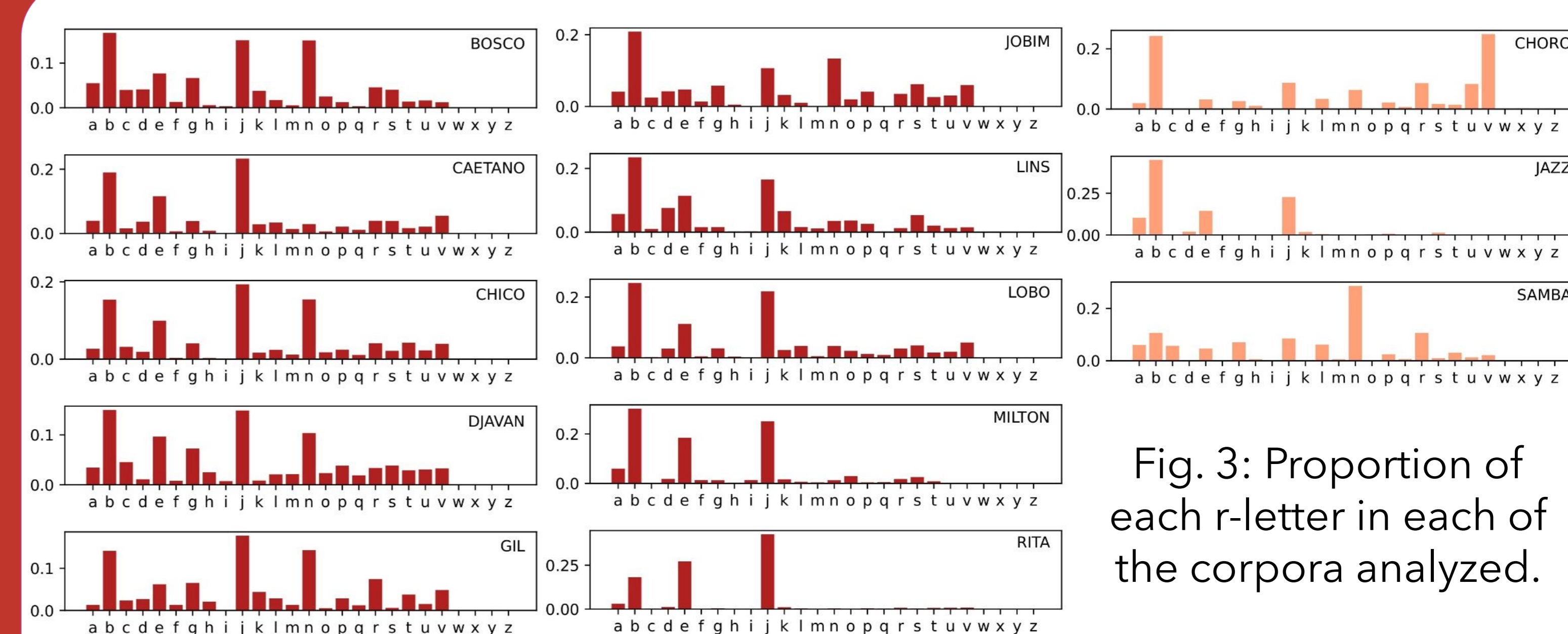


Fig. 3: Proportion of each r-letter in each of the corpora analyzed.

r-letter distribution:

- "b" (single attack point) is the most frequent across the corpora, with variations highlighting stylistic differences
- *Samba* and *choro* show distinctive rhythmic patterns, such as the prominence of "n" (*samba*) and "v" (*choro*)
- Some composers exhibit unique rhythmic tendencies, e.g., a high occurrence of "j" in Rita Lee's corpus

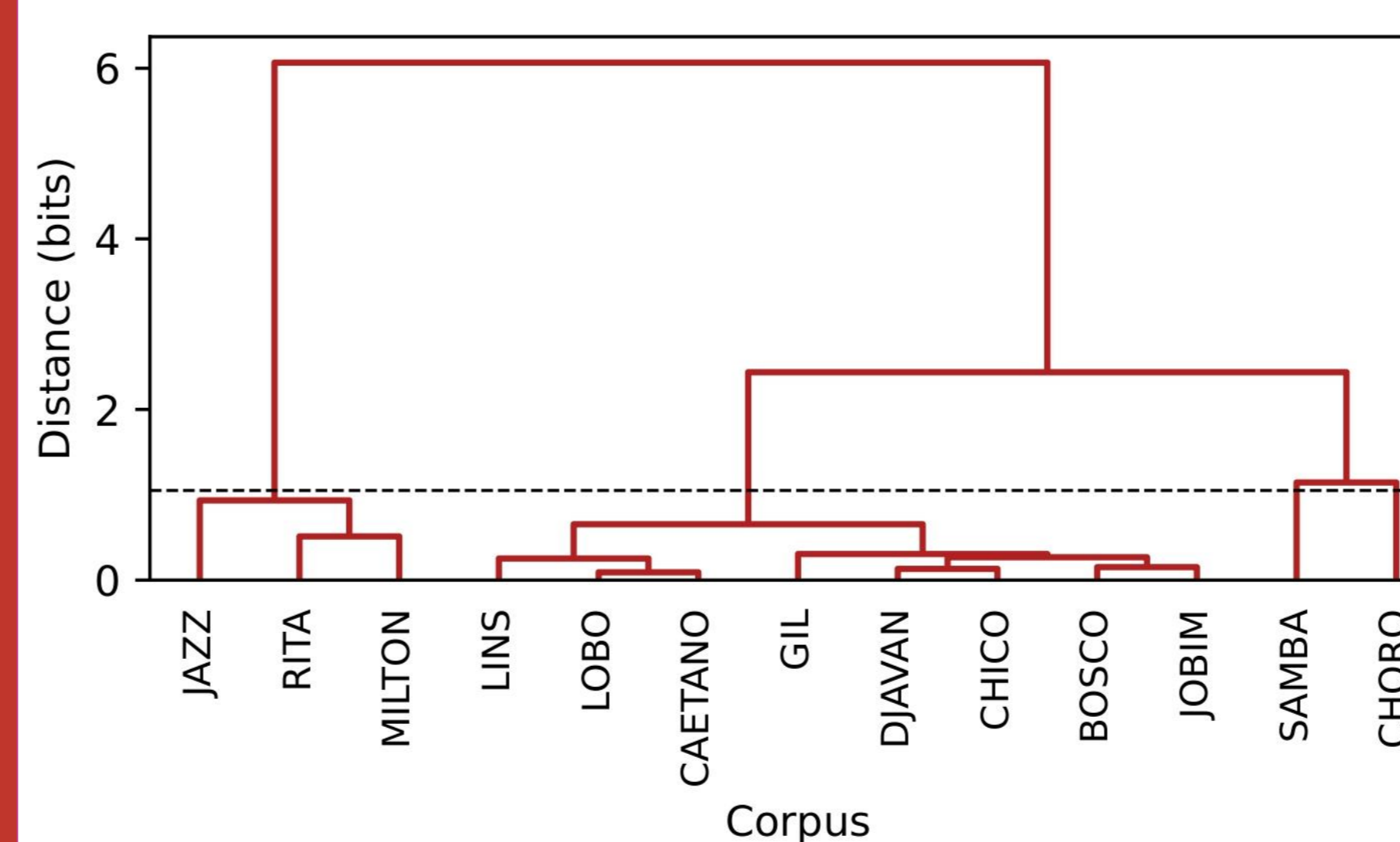


Fig. 4: Dendrograms illustrating a hierarchical clustering of the bar charts on Fig. 3. Distances between pairs of corpora are the symmetrized Kullback-Leibler divergence computed between their respective bar charts on Fig. 3.

The dendrogram shows two main groupings:

- First group: Ivan Lins, Edu Lobo, Caetano Veloso, Gilberto Gil, Djavan, Chico Buarque, João Bosco, and Tom Jobim. Rhythmic similarities that aligns more closely with *samba*
- Second group: Jazz, Rita Lee, and Milton Nascimento. Distinct rhythmic patterns, especially in the case of Rita Lee, influenced by rock and rhythm-and-blues, and in Milton Nascimento's case, by jazz and other sources
- Effective separation between genres and composers based on rhythmic identity

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