

Higher chords are more closely spaced in semitones but not in Hertz

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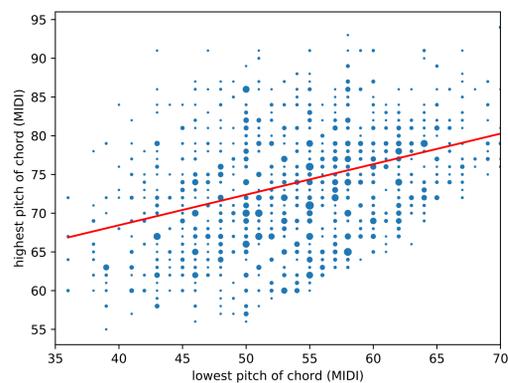


Figure 1: Unsurprisingly, chords (onset simultaneities) have a positive correlation between lowest and highest pitches, as encoded in MIDI values

Although models of tonality tend to assume relative pitch (i.e. scale degrees) [3, 7], absolute pitch disrupts tonal perception via both key and register [6, 1]. Thus chords should vary under transposition. To consider such variance, we consider correlations between chord spacing and pitch height in a corpus of Haydn and Mozart string quartets. Chord span is roughly constant in frequency, but thus varies in semitones.

approx. equal spacing in semitones  approx. equal spacing in Hertz

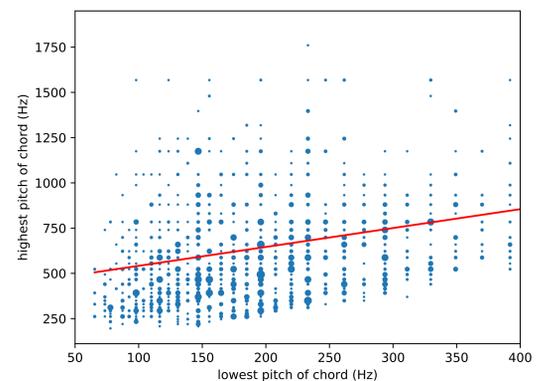


Figure 2: This positive correlation between chords' lowest and highest pitches persists under reencoding in frequency.

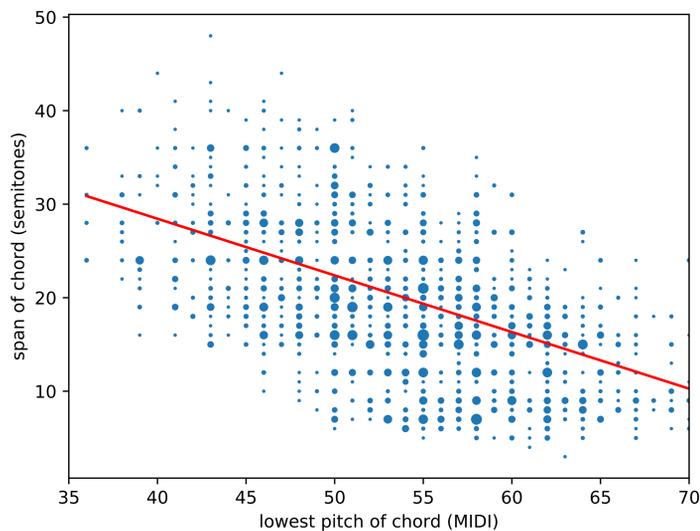


Figure 3: A chord's span in semitones negatively correlates with its lowest pitch. This is unsurprising and partially explained statistically: if the highest note is constant, then the span steadily decreases as the lowest note increases.

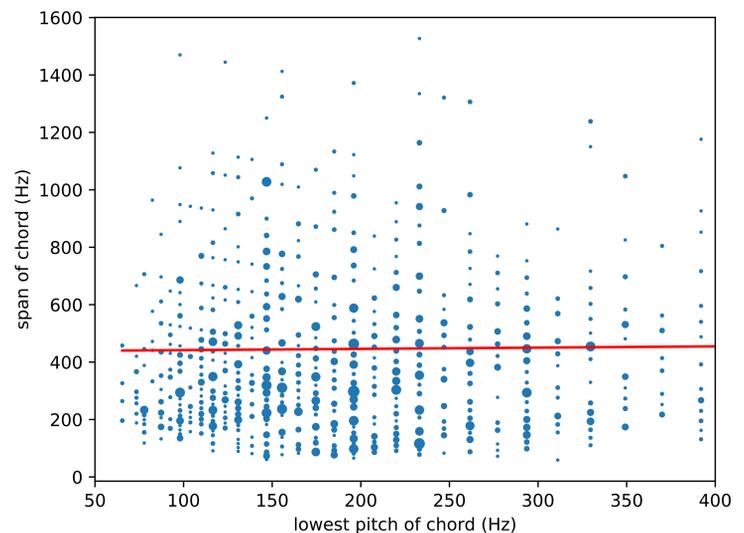


Figure 4: Under reencoding in frequency, the finding of Figure 3 disappears; the span in Hertz has no correlation with lowest pitch. This feature is visible only when looking at linear span, and is not visible in the low-high correlations above.

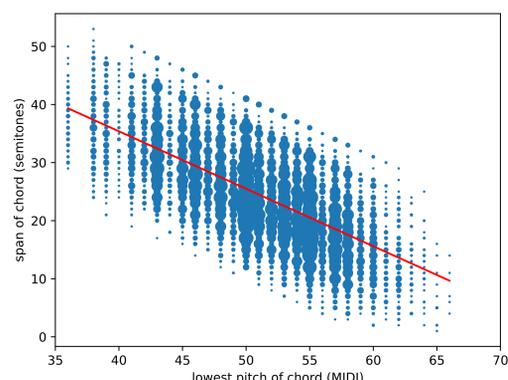


Figure 5: Semitone span in a randomized control corpus, showing a stronger and more regular negative correlation than above, at the expense of features like octave spans.

As a control for potential confounds, we also consider the same metrics on a new corpus of chords generated randomly from pitch distributions in the quartet corpus. Lowest pitch and pitch height are negatively correlated in both cases, as predicted in the caption of Figure 3. In comparison to this random control, Figure 4 actually suggests chords are more widely-spaced than by chance, in particular that overall frequency span is invariant over register.

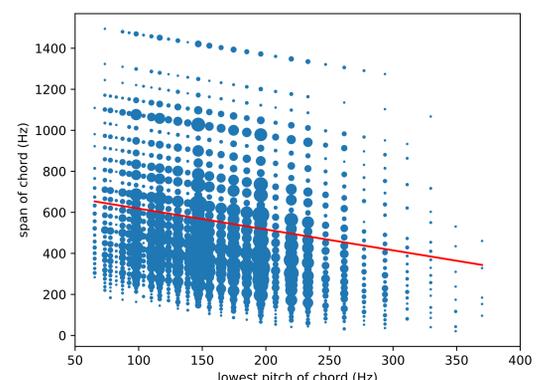


Figure 6: Span in a randomized control corpus, in Hertz, showing a strong negative correlation distinct from the actual corpus' null correlation.

Discussion

These results show that chords as notated, although usually described in terms of semitones, have features that better match the language of Hertz, which is more often used in spectral contexts [5]. Even previous research on chord spacing, measuring against critical bands, leans heavily into timbre in order to justify linear rather than logarithmic frequency scaling [4, 2]. The results in this poster show that chords resemble timbres even if we do not consider the partials of the instruments they are played with.

References

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