

STAT675 Final Project

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Context and Dataset

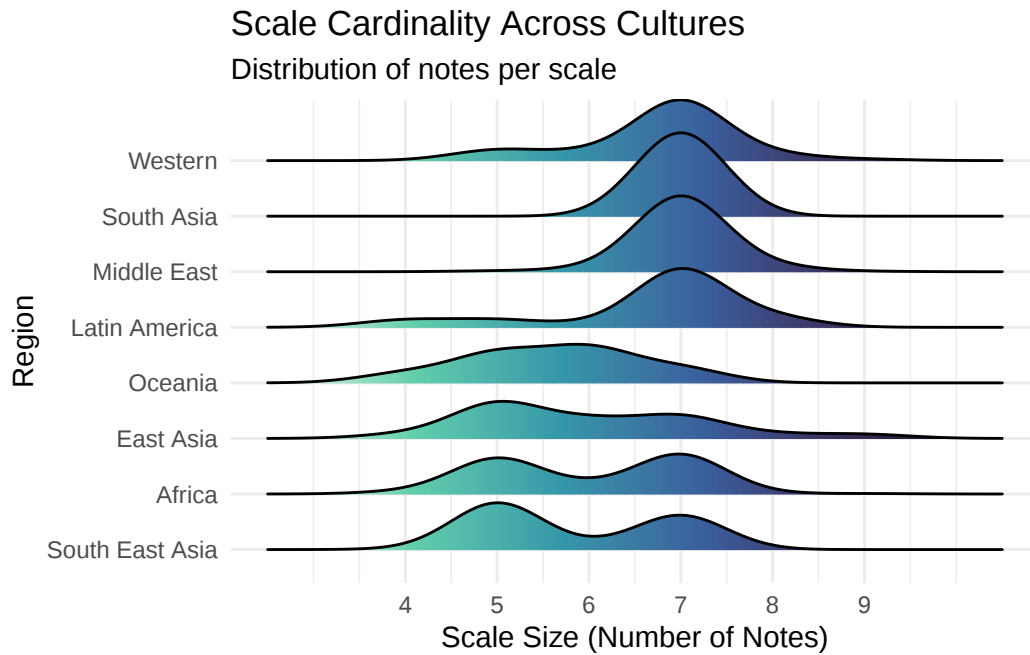
The dataset I chose to analyze for this project is called DaMuSc: Database of Musical Scales (McBride, Passmore, and Tlusty 2023). It is a collection of musical scales from across the world with information relating to theory scales, measured scales, and octave scales. There is metadata provided as well with more information about each of the societies.

A Brief Primer: The Building Blocks of Music

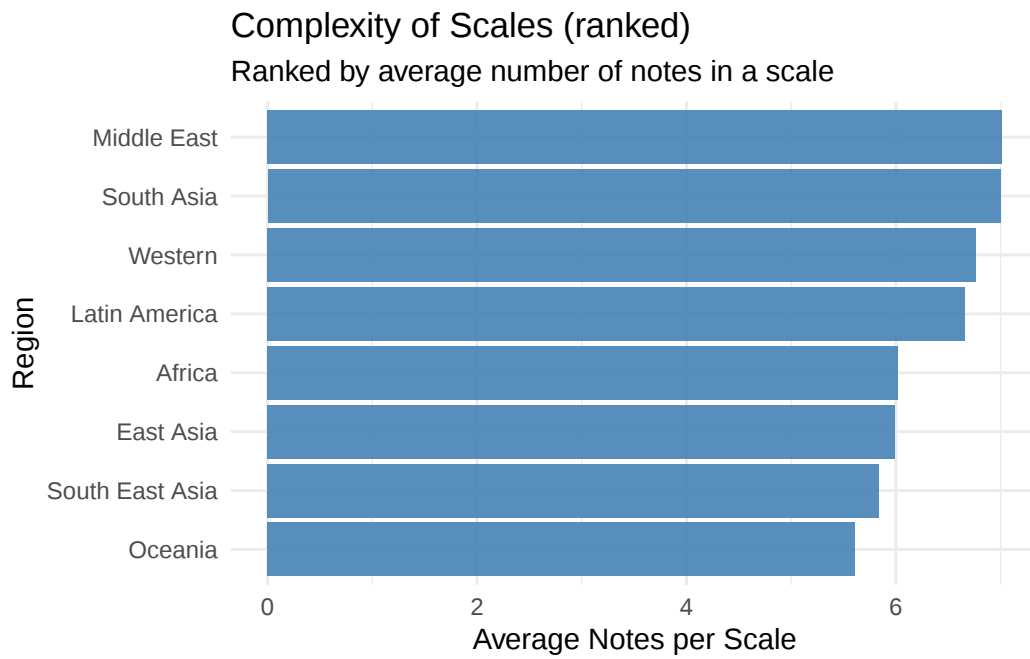
Before diving into the data, it is helpful to establish a few foundational musical concepts for readers who may not be familiar with music theory.

- **The Scale:** Think of a scale as a musical alphabet or a painter's color palette. It is simply a specific sequence of unique notes chosen from the infinite spectrum of sound. When we ask "how many notes are in a scale," we are asking how many primary colors a culture uses to paint their melodies.
- **The Interval:** If a note is a specific location, an interval is the exact distance between two distinct notes. Just as we measure physical distance in inches or centimeters, ethnomusicologists measure acoustic distance in a unit called *cents*. A standard key on a piano is exactly 100 cents away from the key next to it.
- **The Interval from the Root (Tonic):** Every scale has a starting note, often called the root or the tonic. The "interval from the root" is a way of measuring exactly how far away every other note in the scale is from that starting anchor. Imagine the root note as the "0" mark on a ruler; measuring the interval from the root tells us precisely where the other notes fall along that acoustic ruler.

By analyzing this dataset, we would like to answer the question, are certain societies more musically complex and developed than others based on music theory and scale sizes?



Note the regions that have more notes on average in their musical scales.



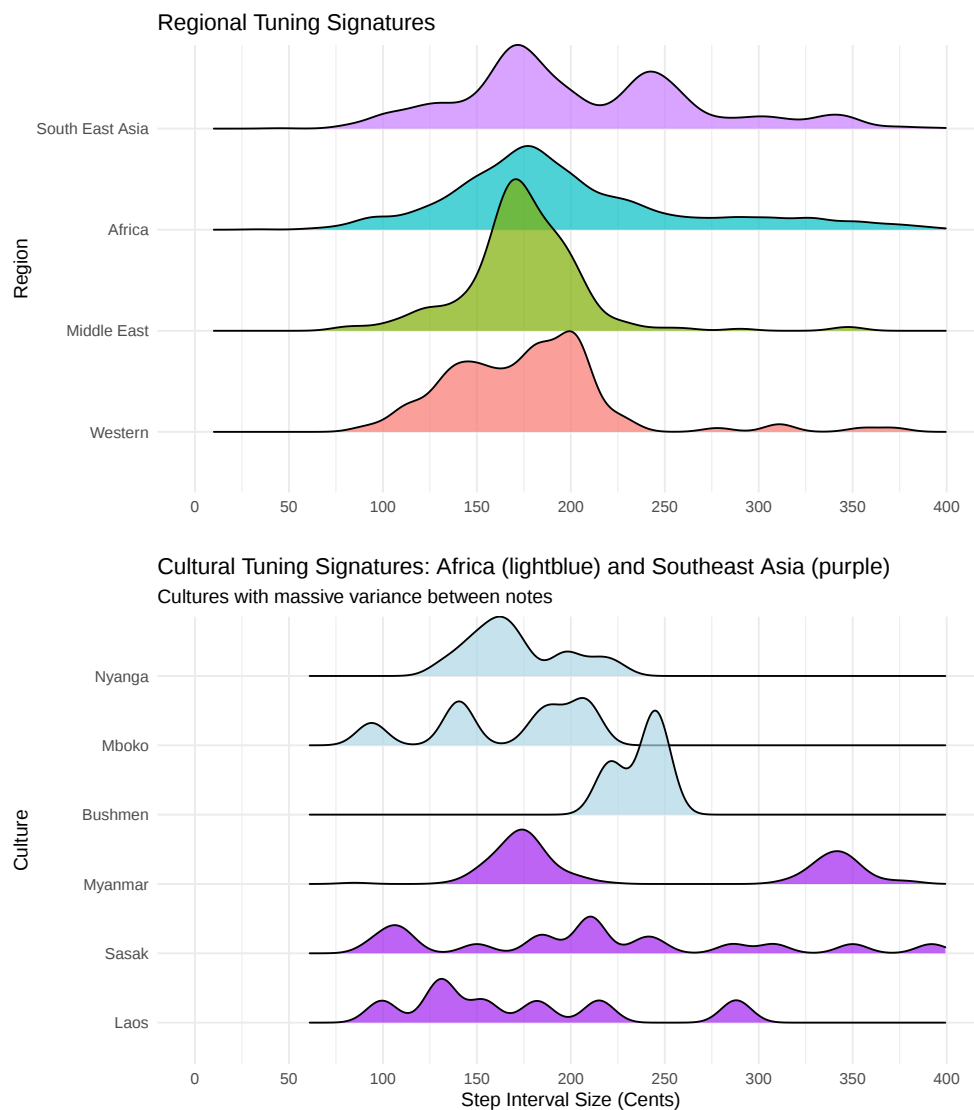
Note the average notes per scale for each region.

Conclusions from the Plots...

The musical regions that have the most complexity are Western, South Asia, Middle East, and Latin America. These regions all have scale sizes that average around 7 notes per scale. There are much more possible melodies that can be played with using more notes. Oceania, East Asia, Africa, and South East Asia all appear to gravitate towards scales of 5 notes, resulting in less possible melodic complexity.

...Quite the Contrary, Actually

A lot of the music that is played in the musically “simpler” societies is in the pentatonic scale having 5 notes (considered one of the most universal musical frameworks in human history, used in Chinese flutes, Appalachian folk, Jazz, Funk, West African xylophones, or Indonesian Gamelan) . While these scales may not be as numerous in notes, they have a considerable amount going on *between* the notes. The sonic space between notes is utilized much more by regions that primarily use the pentatonic scale. Comparing the West to South East Asia or Africa, one can see the way in which the latter two have a much broader sonic brush stroke when it comes to making melodies.



Conclusion

Defining complexity of music by number of notes in a scale, music theory rigor, and adherence to the small sonic sphere around defined notes is not a good measure of musical complexity. After looking at what is going on between the notes of these “simpler” scales, one can see they are anything but simple.

Source of Data

<https://github.com/jomimc/DaMuSc/tree/main>

McBride, John M., Sam Passmore, and Tsvi Tlusty. 2023. “Convergent Evolution in a Large Cross-Cultural Database of Musical Scales.” Edited by Steve Zimmerman. *PLOS ONE* 18 (12): e0284851. <https://doi.org/10.1371/journal.pone.0284851>.