TABLATURE ANALYSIS OF MUSIC USING NON-STANDARD GUITAR TUNINGS

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ABSTRACT

This study explores the musicological implications of alternate guitar tunings through computational analysis of tablature data. We compile a dataset of 159 songs (339 guitar parts) across a range of tunings and genres. By analysing string-fret usage patterns and chord vocabularies, we investigate how different tunings influence fretboard geography and harmonic choices. Our findings reveal distinct tuning-dependent behaviours: drop tunings favour lower fret positions and simplified power chord shapes, while open tunings encourage exploration within certain scales by making them more accessible. These results highlight how alternate tunings function not only as technical adaptations but also as creative affordances that shape compositional and performative practice.

1. INTRODUCTION

Alternate tunings play a significant role in shaping the musicological and physical practicality of guitar performance. While standard tuning (E-A-D-G-B-e) remains the default configuration for most guitarists, deviations from this such as Drop D, Open D, and Drop C has enabled different possibilities across genres. Such as the resonant open strings of folk and blues music and the common power chord structures of metal, the tuning choices of musicians are often chosen with intent about musical possibility and physical playability that a given tuning can afford.

Despite this, alternate tunings remain under-explored in musicology, particularly in computational music analysis. Existing studies in this area have focused on standard tunings [1]. However, with the popularity of the guitar especially amongst amateur musicians [2], there is an abundance of tablature (tabs) in different tunings and styles available online on sites such as Ultimate Guitar [3]. This presents a opportunity for further computational analysis to try understand these better.

In this study, our contributions firstly include the creation of a custom dataset of standard, Drop D, Open D and Drop C tunings across different genres. We then present analysis of the guitar tablature data to investigate how different tunings influence fretboard usage and chord transitions. From this we try to gain an understanding of the musicological implications of the different tunings.

2. RELATED WORK

Previous scholarship in musicology has explored the relevance of guitar tunings in both composition and performance. While the conventional use of E-A-D-G-B-e (standard) tuning has been attributed to a compromise between physical practicality and harmonic flexibility [4], alternate tunings can significantly expand the sonic possibilities of guitar music. For instance, the D major chord constructed by the open strings in Open D tuning can be used to produce resonant drones in fingerstyle folk music or facilitate the use of a slide, which is common in blues and Hawaiian slack-key traditions [5] [6].

Artistic motivations for using alternate tunings are also well-documented. Joni Mitchell's extensive use of open tunings allowed her to "break out of familiar patterns," crafting harmonies that would otherwise be inaccessible through standard tuning [6]. In this sense, alternate tunings can be understood not just as technical configurations, but as compositional tools that shape a player's harmonic imagination. Jones [5] further argues that alternate tunings subvert muscle memory, forcing the guitarist to develop new positional habits and shape-based patterns on the fretboard. These new physical routines carry implications beyond technique, shaping performers' musical identity through what he calls a guitarist's embodied "guitarism".

The physical and cognitive factors that influence guitar "playability" have recently attracted attention in the MIR community. Velez et al. developed a rubric to quantify guitar playability based on criteria like chord familiarity, finger stretch, and positional shifts [7]. They note that even subtle changes in chord shape or string usage can make a passage significantly more or less difficult for amateur players, underscoring the relevance of fretboard geography.

In light of this, alternate tunings can also be evaluated through the lens of playability. Drop tunings such as Drop D (D-A-D-G-B-e) are popular in heavy rock and metal partly because they simplify power chords: a single one-finger barre can now yield a perfect fifth across the low-

est strings. This is not only a matter of physical ease but it also enables faster and more aggressive strumming patterns, which can be seen to aesthetically match the distorted sound textures [8] [9].

Given the guitar's popularity and the abundance of user-generated transcriptions online, guitar tablature offers a rich yet underutilised resource for computational musicology. Macrae and Dixon [10] explored the viability of ASCII-format tabs from Ultimate Guitar as data sources, evaluating their accuracy and consistency across versions. More recently, Regnier et al. [11] trained a bi-directional LSTM to distinguish rhythm guitar parts in tabs, demonstrating that automated tablature analysis can be used to learn structural elements like chord repetition and strumming patterns.

However, few studies have leveraged this vast repository of tablature data to examine broader musicological patterns. One notable exception is Cournut et al., who analysed large-scale guitar tablature to identify common positional patterns across strings and frets [1]. Their work focused on how genre and playing style influence the distribution of hand positions, offering a statistical lens into performance practice. Sadly however, the dataset they use is not publicly available and is limited to standard tuning. Our work builds on this lineage by analysing large-scale fret and chord usage across tunings and genres, situating tab data within musical and performative contexts.

3. METHODOLOGY

3.1 Dataset Creation

We created a dataset by downloading user-submitted Guitar Pro tracks from the Ultimate Guitar website [3] categorised by tuning: Standard, Open D, Drop D and Drop C. We collected the most popular tabs by genre including Blues, Folk, Jazz, Metal, Pop and Rock. For each tuning we aimed to balance the quantity of songs for each genre. We found however that alternative tunings often lacked balanced genre representation; for instance, Drop C was absent in genres such as Jazz, Blues, and Folk. As a result, Drop C tuning is not considered in all subsequent analyses.

Our final dataset comprises 159 usable songs. While more were initially collected, some files were corrupted and thus unreadable by our code and were therefore discarded. Each Guitar Pro file contains instrument-specific "tracks," which we henceforth refer to as part(s). In total, from the full set of songs we have 339 parts that use one of the selected tunings.

The final composition of our dataset at the part level, grouped by genre and tuning, is shown in Table 1. The high number of parts in standard tuning is largely due to alternative tuning scores often including standard-tuned parts. We chose to retain these rather than discard them, as our analysis is normalised, and removing data would only serve to lessen the potential for drawing broader conclusions from an already small dataset.

Tuning	Blues	Folk	Jazz	Metal	Pop	Rock
Drop C	0	0	0	17	3	25
Drop D	11	9	8	31	12	24
Open D	8	10	0	7	6	14
Standard	25	27	18	23	25	36

Table 1. Number of parts (the instrument-level tabs with a given tuning in a song) per genre and tuning.

3.2 Guitar Pro File Parsing and Feature Extraction

We are interested in the finding the frequency that different strings and frets are used across the different tunings and genres. To extract the features to do this we developed a Python pipeline using the *guitarpro* library [12] to analyse Guitar Pro tablature files. For each file, we extracted metadata (title, artist, album) and analysed each track part by recording its name, instrument, tuning (as MIDI values), and string-fret usage. The latter was computed by counting note occurrences on each string and fret across all measures. Files were organized by tuning and genre in a nested directory structure. The script recursively traversed this structure, processing files with Guitar Pro extensions (.gp3, .gp4, .gp5, .gpx, .gp). For each successful analysis, the tuning and genre labels were appended to the track data. The results were saved in a structured JSON file, and any files that failed to process were logged in a separate text file for reference.

3.3 Chord Change Analysis

To better understand harmonic structure, we examine the distribution of chords, and how this differs within the different tunings and genres. Rather than relying on raw chord frequencies, we computed chord changes to try better reflect the harmonic progression of each piece. Raw counts tend to over-represent static harmonic regions (e.g., when a chord is repeated or sustained over multiple measures), which inflates the importance of frequently held chords and obscures the harmonic activity we are more interested in.

To analyse chord changes across the dataset, we first converted all Guitar Pro tablature files to MusicXML format using TuxGuitar [13]. The MusicXML files were then processed using the music21 library to extract harmonic content.

For each guitar part, we identified chord changes by detecting transitions between unique chord signatures (defined by pitch class sets and bass notes). We computed two types of statistics: (1) Named chord changes, and (2) Root note transitions, capturing the changes in harmonic roots.

Both statistics were normalised per part to account for differences in track lengths. We then aggregate the results across the different tunings and genres to inspect the distribution of chord types and root transitions across groupings.

The code used in our implementation and the curated dataset can be found in the repository online here [1] .

[1] Public repository containing our code and dataset can be found at `https://github.com/arhanv/ug-dataset`

4. RESULTS

4.1 String and Fret Usage

Given that alternate tunings are often selected to support specific musical objectives, we expected to observe corresponding differences in how the fretboard is used. The results largely affirm this hypothesis, with each tuning showing a pattern of string and fret usage that reflects both ergonomic and compositional needs.

In standard tuning, the fretboard heatmap (Figure 6) shows a broad and balanced distribution of note usage across both string sets and fret regions. Players make use of open strings and fretted notes in roughly equal measure, and movement across all six strings is fairly common, even into the second octave range of each string (past fret 12). This is likely due to the wide range of musical scenarios in which standard tuning is used, from rhythm guitar to lead and fingerstyle. It may also reflect the favourability of barre chords in this tuning: since chord shapes can be moved up and down the fretboard while engaging five or six strings, the entire fretboard becomes harmonically accessible with minimal positional change.

In contrast, drop tunings (such as Drop D and Drop C) have usage that is concentrated on the lowest string, which is tuned down from its standard pitch. This aligns with the musical intent behind these tunings, which is often to extend the instrument's lower range. The expanded accessibility of root–fifth power chords across adjacent strings, especially the 6th, 5th, and 4th, seems to encourage chord voicings that remain fixed across these three strings. This is visible in the consistent horizontal bands of activity in the heatmaps (Figures 1 and 8). These patterns are particularly prominent in genres such as metal, where low-register chugging and palm-muted riffs are common.

The usage profile of Open D tuning is distinct. Note activity skews heavily toward open strings, consistent with the resonant, droning sound characteristic of slide guitar and fingerstyle folk traditions. Since the open strings in Open D form a D major chord, we expected much of the playing to occur within scales rooted in D. Augmenting the open chord with a 7th, 9th, and other extensions is particularly easy. This is evidently the case in our dataset; the fretboard heatmap for Open D appears to be particularly strong around notes from the D Ionian scale (Figure 2). Fret usage declines sharply past the twelfth fret, which may reflect both practical limitations of fingerstyle access and the tonal goals of compositions in this tuning.

We also make a few genre-specific observations. Within Drop D, for example, metal tracks show heavier reliance on the low D string compared to rock overall. In standard tuning, jazz and pop tracks tend to incorporate higher strings (1 and 2) more frequently than metal (Figures 9 and 10), suggesting greater emphasis on extended harmonies or melodic upper voices. Even in Drop D, jazz guitar parts display a more even distribution across the fretboard (Figure 11), indicating that tuning constraints are mediated by genre conventions.

4.2 Chord Vocabularies

Our analysis reveals clear differences in chord vocabulary across tunings, both in terms of harmonic complexity and tonal center. As shown in **Figure 3**, chords built on perfect fourths with octave doublings are disproportionately frequent in Drop D and Open D tunings, surpassing major triads. This suggests that alternate tunings are more likely to exhibit chord shapes based on stacked intervals and dyadic relationships due to the relationship between the D-A-D strings. In heavier styles like rock and metal, this facilitates the use of distortion pedals while minimizing noisiness. Standard tuning, by contrast, shows a more balanced distribution across triadic forms. Major and minor triads, as well as tertian chords more broadly, occur with greater regularity.

Figure 4 further contextualizes these findings by showing how root note frequencies vary across tunings. Open D and Drop D both exhibit a strong bias toward D-rooted chords, accounting for 31% and 23% of all chord changes respectively. Standard tuning, meanwhile, distributes chord roots more evenly across D, A, G, E, and C. This supports the view that alternate tunings, especially open tunings, reinforce a tonal center by design. Compared to standard tuning, they nudge the player or composer towards certain harmonic choices by making them more accessible.

5. EVALUATION

5.1 Dataset Limitations

Our study faces several methodological constraints. Transcriptions from Ultimate Guitar are user contributions and may contain simplifications, particularly when the original tuning is uncommon or complex. In such cases, transcribers might adapt the piece into a more familiar tuning, which can obscure the harmonic and performative intentions of the original. Additionally, tabs may be re-arranged or re-transcribed for different instruments, further distancing them from their source recordings. Both these features of user generated tabs could have some implication on our results in terms of the accuracy of patterns we observe.

We also see considerable data sparsity in certain genre–tuning pairings, such as Open D in jazz or Drop D in pop. This uneven distribution limited our ability to draw reliable conclusions in these cases. While Ultimate Guitar hosts a much larger corpus of material, including both ASCII-format and proprietary "Official" tabs, we encountered significant difficulties parsing this data at scale due to inconsistencies in formatting and access. Future work might explore more robust scraping and parsing techniques to unlock the full potential of these resources. A larger dataset via this approach would be very beneficial and we could more readily make comparisons to the existing literature in [1]. Moreover, a larger dataset would allow us to make more statistically significant findings especially in terms of inter-genre comparisons within tunings, which in our dataset was difficult to do due to the size.

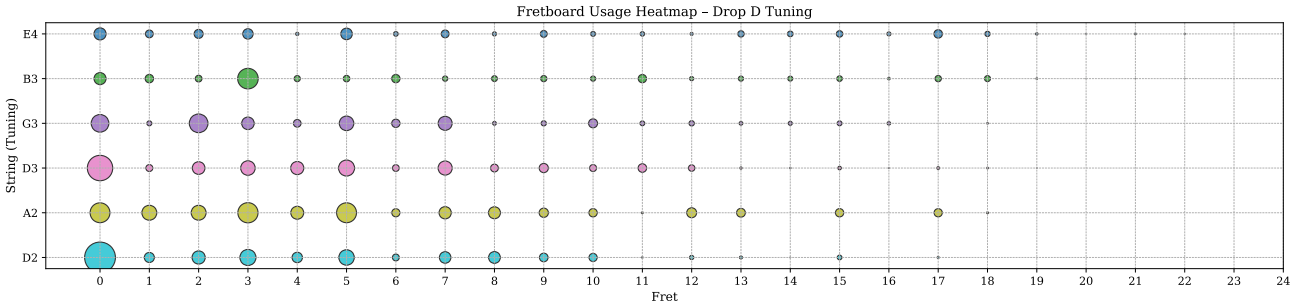

Figure 1. Fretboard usage heatmap for all songs in our dataset in Drop D tuning.

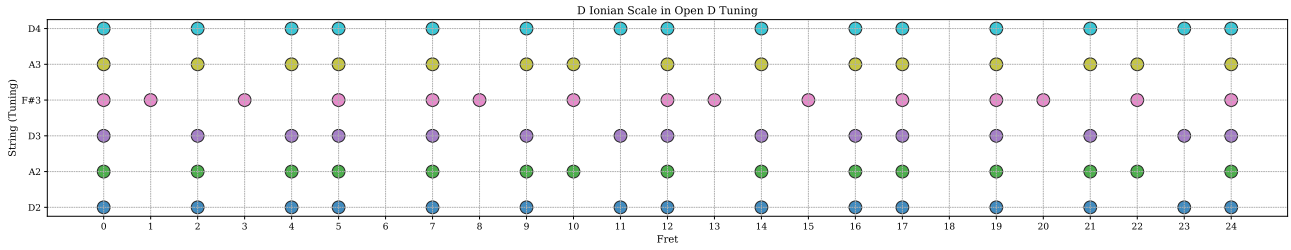

Figure 2. D Ionian scale on fretboard in Open D Tuning.

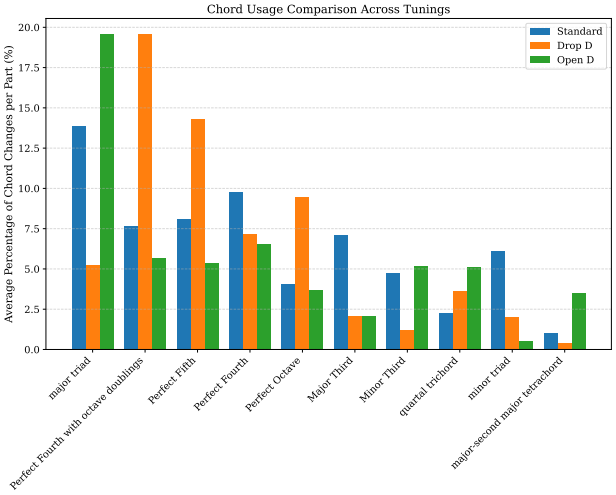

Figure 3. Chord usage analysis across the different tunings. We plot only the top 10 most frequent chords.

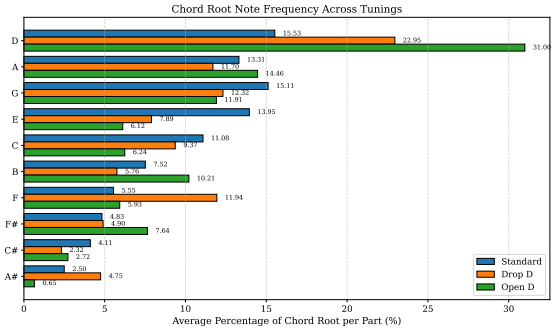

Figure 4. Chord usage analysis across the different tunings. We plot only the top 10 most frequent.

5.2 Limitations in our Analysis

In our study we focused on two main aspects, fret usage and chord vocabularies across tunings. To expand the scope of our findings we could analyse the transitions between chords over longer ranges. Whether different tunings influence longer-range dependencies in harmonic transitions in guitar playing. This might be useful in informing approaches in automatic transcription, where non-standard tunings have been harder to classify [14].

6. CONCLUSION AND OUTLOOK

This study highlights the musicological significance of alternate guitar tunings through computational analysis of tablature. By examining fretboard and chord usage across genres and tunings, we demonstrate how alternate tunings can help to reconfigure not just the physical layout of the guitar but also shape the musical decisions around a piece, from chord shapes to the tonal center itself. Drop tunings encourage low-register power chords and concentrated fretboard regions, while open tunings privilege open strings and scalar patterns aligned with the tuning's root chord. Standard tuning, in contrast, supports a broader harmonic palette and greater mobility, while alternate tunings often channel players toward particular sonorities, tonalities, or playing techniques.

Future work could focus on expanding the dataset so as to support more statistically reliable results, as well as incorporating alternate methodologies to better understand how specific tunings influence temporal harmonic patterns.

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A. APPENDIX

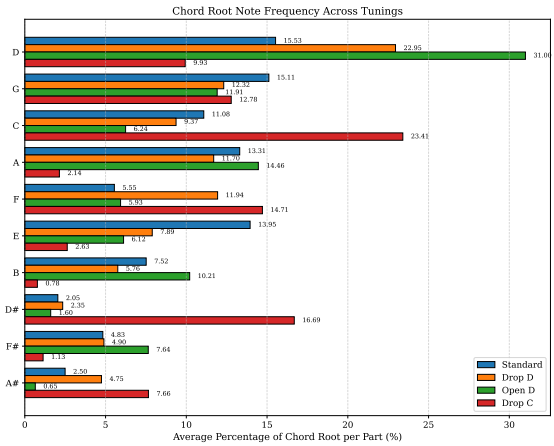

Figure 5. Chord usage analysis across the different tunings. We plot only the top 10 most frequent. We include Drop C in this figure.

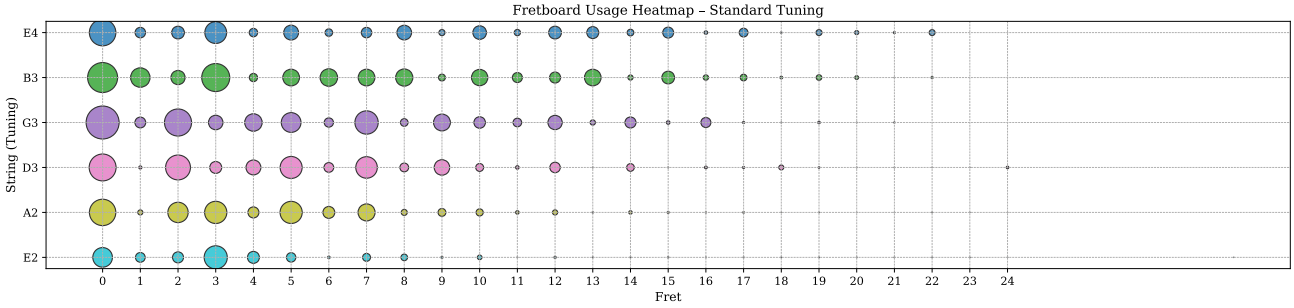

Figure 6. Fretboard Usage Heatmap for Standard Tuning.

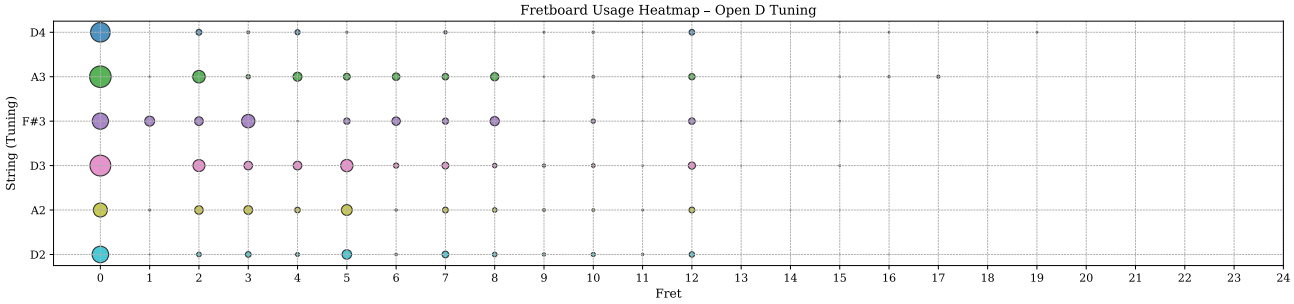

Figure 7. Fretboard Usage Heatmap for Open D Tuning.

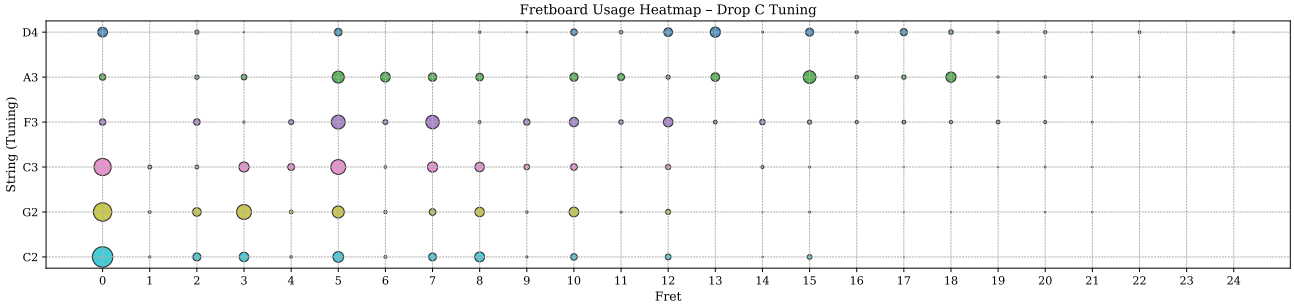

Figure 8. Fretboard Usage Heatmap for Drop C Tuning.

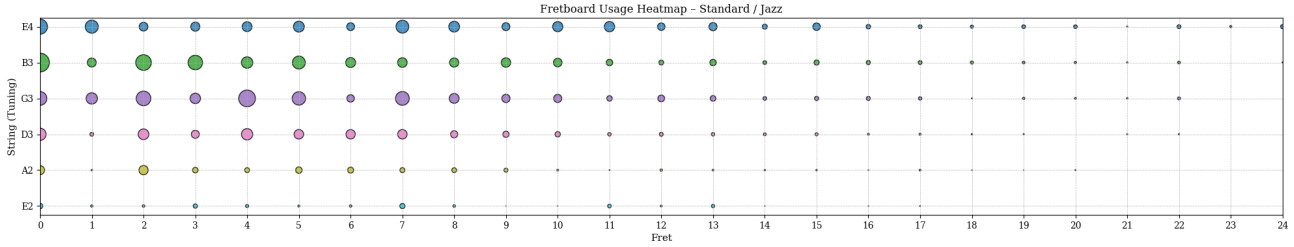

Figure 9. Fretboard Usage Heatmap for Jazz Songs Only - Standard Tuning.

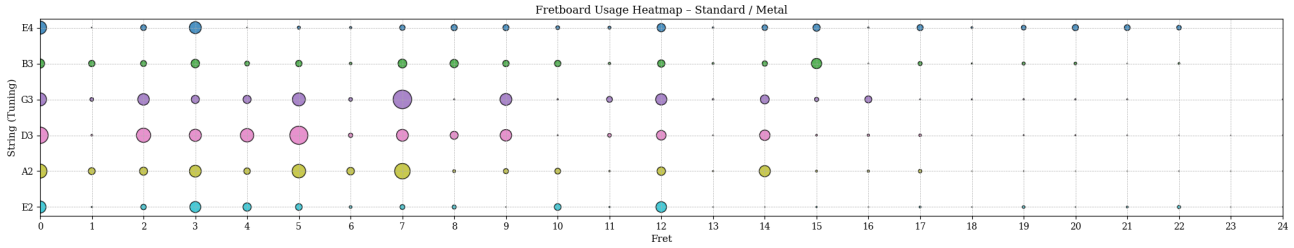

Figure 10. Fretboard Usage Heatmap for Metal Songs Only - Standard Tuning.

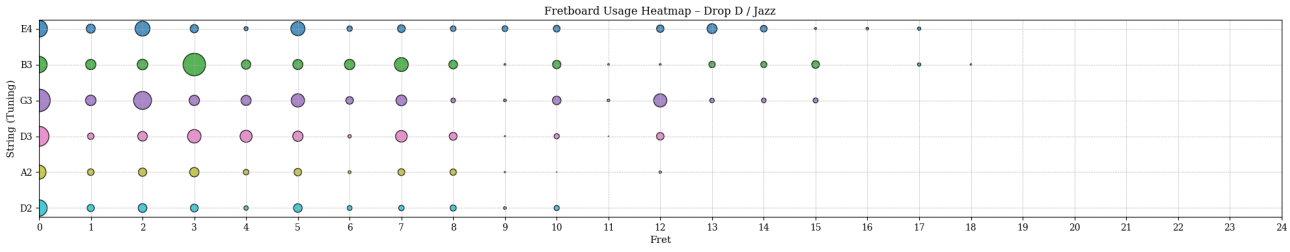

Figure 11. Fretboard Usage Heatmap for Jazz Songs Only - Drop D Tuning.