Genre	Slope	R^2	Slope Std	R^2 Std
Baroque	-1.1784	0.8114	0.2688	0.0679
Classical	-1.2639	0.8357	0.1915	0.0526
Early Romantic	-1.3299	0.8215	0.2006	0.0551
Romantic	-1.2107	0.8168	0.2951	0.0609
Late Romantic	-1.1892	0.8443	0.2613	0.0667
Post Romantic	-1.2387	0.8295	0.1577	0.0550
Modern Romantic	-1.3528	0.8594	0.0818	0.0294
Impressionist	-0.9186	0.8372	N/A	N/A
12 Tone	-0.8193	0.7887	0.2461	0.0964
Jazz	-1.0510	0.7864	0.2119	0.0796
Rock	-1.2780	0.8168	0.2967	0.0844
Pop	-1.2689	0.8194	0.2441	0.0645
Punk Rock	-1.5288	0.8356	0.5719	0.0954
DNA	-0.7126	0.7158	0.2657	0.1617
Random (Pink)	-0.8714	0.8264	0.3077	0.0852
Random (White)	-0.4430	0.6297	0.2036	0.1184

Table 1. Average results across metrics for each genre.

7.3. Discussion

Overall, the results indicate that aspects of beauty in music may be algorithmically identifiable and classifiable. The average for all musical pieces (excluding DNA, pink random, and white random pieces) across all metrics is –1.2004, a near-Zipfian distribution; the corresponding fit across all metrics is 0.8213.

For illustration purposes, figure 3 shows the pitch distribution for Bach's Orchestral Suite No.3 in D 'Air on the G String', BWV.1068. Its slope is –1.078, and its fit is 0.8102. Figure 4 shows the harmonic interval distribution for Bach's Two-Part Invention No. 13 in A minor, BWV.784. Its slope is –1.0776, and its fit is 0.8992.

The reader should compare these to examples from random piece No. 7. This piece was "composed" via a uniform-distribution (white noise) random number generator. Figures 5 and 6 show the pitch distribution and harmonic-interval distributions, respectively, for this piece. The corresponding slopes are –0.1849 and –0.6026, respectively.

Remarks on Pitch Mod 12 Results

Study of individual metrics reveals several patterns perhaps beyond the scope of this paper, but too interesting to not mention. One such pattern is related to the Pitch-Mod-12 metric. As mentioned earlier, this metric captures the number of times each pitch of the 12–note chromatic scale occurs in a given piece of music.

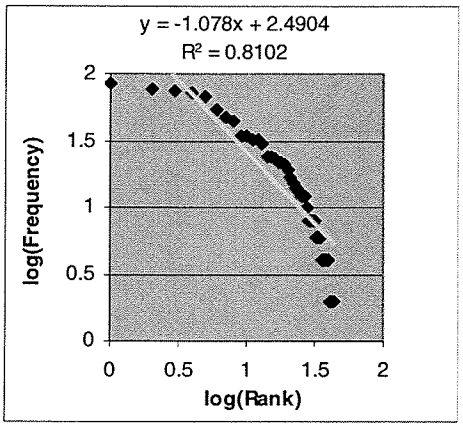

Fig. 3. Pitch distribution for Bach's Orchestral Suite No.3 in D 'Air on the G String', BWV.1068.

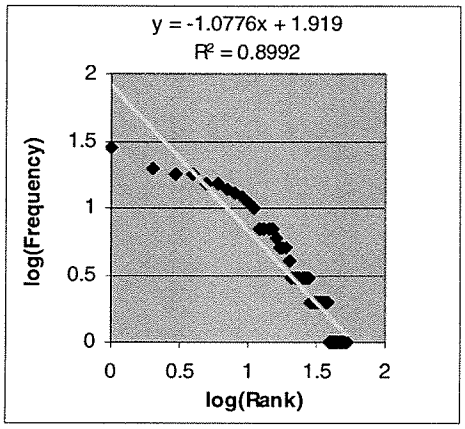

Fig. 4. Harmonic interval distribution for Bach's Two-Part Invention No. 13 in A–, BWV.784.

In the case of 12-tone music, we expected to see slopes suggesting uniform distribution (slope close to 0). Indeed, the corresponding slope for 12-tone pieces averaged –0.3168 with a standard deviation of 0.1801. In particular, Schönberg's pieces averaged –0.2801 with a standard deviation of –0.1549. This was comparable to the average for random (white noise) pieces, namely –0.1535. Obviously, this metric is very reliable in identifying 12-tone music, since such metric is characterized by the uniform distribution of pitches.

For comparison purposes, the next closest average slope for musical pieces was exhibited by Jazz pieces (–0.8770), followed by Late Romantic ones (–1.0741).

8. Limitations

Statistical approaches, such as the one reported herein, are abstractions. If successful, they tend to summarize the essential while abstracting (hiding) the unessential. But this is not always so. Nettheim [16] describes this limitation of statistical approaches in musicology as follows: