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*Title*: **A Compression-Based Model of Musical Learning**

*Preference for talk or poster: NO PREFERENCE*

*Abstract*:

A long tradition of psychological research considers perception to be governed by the *simplicity principle* [1,2]. Both music perception and music analysis involve searching for the simplest explanations for musical objects, where a musical *object* could be any quantity of music from a motive to a whole corpus. Musical objects are usually interpreted within the context of larger objects that contain them. For example, a work might be interpreted in the context of a corpus containing all the works by the same composer. Drawing on Kolmogorov complexity theory [3], I propose that an *interpretation* or *reading* of a musical object can be modeled as a *program* that computes an in extenso representation of the object. On this view, when interpreting a musical work for the first time, both the analyst and the listener's brain are seen to be attempting to find the *shortest* programs that compute corpora containing the new work. In the case of the listener, the new work is interpreted largely non-consciously and in real-time in the context of a corpus which is a subset of all the music that the listener has previously heard. The analyst, on the other hand, is free to deliberately select a corpus that allows for the most satisfying (usually the most economical) interpretation of the new work. This is modelled as the modification of a pre-existing program, *P*, that computes some corpus (i.e., a compact encoding of the corpus), so that it can additionally compute the object to be interpreted. In other words, it is proposed that both the analyst and the listener's brain try to find the shortest description of the new object that reuses as much of *P* as possible. The perceived structure of the object is then represented by the way in which the modified program, *P′*, computes the object. On this view, both music perception and music analysis reduce to the compression of musical corpora. However, because a greedy encoding algorithm is used that resists changes to existing encodings of previously experienced music, the compression is not optimal. This model therefore predicts that each individual will have a unique interpretation of any given piece of music that depends not only on what music the listener has previously heard but also the *order* in which this previously heard music was presented. The model therefore suggests a pure compression-based explanation for musical memory, musical learning and individual differences in musical perception. The feasibility of this view is demonstrated in a computational model which is applied to the first book of J. S. Bach's *Das Wohltemperirte Clavier*. This model pre-processes the data using the author's PS13s1 pitch spelling algorithm [4,5], then applies a modified version of the author's COSIATEC algorithm [6] to derive compact encodings of works that maximise reuse of previous encodings. The resulting analyses will be presented and discussed.

*References*

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[4] Meredith, D. (2006). The *ps13* pitch spelling algorithm. Journal of New Music Research, 35(2):121-159.

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