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## Pitfalls and Windfalls in Corpus Studies of Pop/Rock Music

### ABSTRACT

#### Background

Over the past few decades, computational methods involving annotated collections of music—i.e., corpus studies—have emerged as a promising subfield within music research (cf. Temperley and VanHandel 2013; Shanahan 2016), afforded especially by recent developments in computing technology. In more recent years, corpus methods have begun to be used in the analysis of popular music. Extant corpora of pop/rock music, for example, range from those compiled by a single author (e.g., Summach 2012; Tough 2013), to those created by multiple authors (e.g., Burgoyne et al. 2011; Temperley and de Clercq 2013), to those generated by computer algorithms (e.g., Bertin-Mahieux et al. 2011).

#### Aims and repertoire studied

This paper surveys how computational approaches involving corpus methods have been used to examine, model, and understand pop/rock music. (Pop/rock music is defined broadly here, to include styles ranging from country to rap to heavy metal.) Although many parameters in a classical score can be encoded in a straightforward way, pop/rock music presents its own particular challenges for corpus work, since no official score typically exists aside from the original audio recording. In contrast to Western art music, therefore, any symbolic representation of pop/rock music inherently requires an intermediary analytical stage, whether done by a human transcriptionist or by a computer. This paper aims to examine not only the benefits of this type of work with pop/rock music, but—perhaps more importantly—many of the caveats and potential pitfalls that naturally result from the encoding process itself.

#### Methods

The central approach used in this paper is to critically investigate and compare extant corpora as well as the reported findings from studies of these corpora. Fundamentally, a computational approach employs data, and thus the discussion of existing work, research methodologies, and future prospects is framed here in terms of various aspects of this data, as organized into two main sections.

In section one, the focus is on data collection and representation. Although a computational approach ostensibly provides an unbiased measure of musical features, a great deal of subjectivity can be seen to exist within the selection and creation of a corpus. For example, choosing which songs to include can be seen as a type of musical analysis, since it involves judgements on the timespan or substyles represented. The choice of which musical characteristics to study may also derive more from the ease of encoding certain features based on available tools, such as Humdrum (Huron 1995) or music21 (Cuthbert and Ariza 2010), than the relative importance of these features. Moreover, it is argued that translating almost

any musical parameter from an audio recording to a symbolic representation necessarily involves a significant human element, even when this work is done by a computer. Thus while some parameters may initially appear to be rather unambiguous, such as the tempo of a song (or even whether a song is fast or slow), it is shown that these parameters can often display significant levels of disagreement between multiple annotators due to a variety of complicating factors.

Section two tackles data analysis and interpretation, especially in terms of potential perils with statistical methods. In particular, classic problems such as missing or flawed data, contradictory evidence, statistical significance, and correlation versus causation are considered in the context of recent studies of pop/rock. For example, averages calculated across a body of songs may not represent any true stylistic trait but rather the generic midpoint of multiple smaller populations; instead, clustering methods may be more appropriate. In essence, statistical analysis of abstract musical parameters may give the appearance of numerical accuracy despite the problematic assumptions underlying the encoded data itself. To what extent, therefore, can quantitative results be useful in such situations? One recurring line of inquiry is whether we can determine—through the investigation of musical features alone—the commercial or critical success of a song, as exemplified by the controversial field of “Hit Song Science” (Pachet and Roy 2008; Yizhao et al. 2011). At issue is the question of whether a song achieves success because of its typicality or, conversely, achieves success because of its atypicality.

#### Implications

Although empirical work with corpora of pop/rock music offers many windfalls for music theory, such as the ability to confirm and clarify existing speculative hunches, many latent pitfalls exist as well. For example, it is argued here that we can only meaningfully assess the quantitative results from a statistical analysis of a corpus of pop/rock music if encodings from multiple human annotators are available. With multiple human annotators, not only can the applicability of the results be gauged, but also the extent to which individual differences underlie a particular analytical task.

One promising application of corpus work is in the testing and development of automated approaches to music analysis. Key-finding algorithms, for example, can be trained on symbolic data. Additionally, if the symbolic data is time-aligned with original recordings, it can provide a “ground truth” for computerized tempo estimation, chord extraction, and melodic transcriptions of raw audio files. We must be sure to recognize, however, the great variability in interpretation that exists between human analysts in such tasks, which is unavoidably reflected in any computer algorithm based on this “ground truth.” In order to refine our computer-based analytical methods, therefore, we must also refine our understanding of our own perception and intrinsic preconceptions. Corpus work on pop/rock music thus can be seen to shed light not only on the

music under study, but also on the analytical and theoretical frameworks that we use in the encoding of the corpus itself.

### Keywords

Popular music, musical models, recorded music, epistemology.

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