Temporal Evolution of Linguistic and Sentimental Features in Popular Music Genres

A computational-linguistic perspective

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Table of Contents

1 Introduction

2 Data Acquisition and Methodologies

3 Literature and Preliminary Results

4 Further Steps

5 Bibliography

Introduction

- Music is a significant indicator of the linguistic and sociocultural realities of sub-groups in society (Bennett, 2000)
- Temporal evolution in music could be reflective of changes in sub-groups in society
- Anecdotal evidence indicates temporal change in musical genres

Introduction

- Anecdotal evidence:
  - The topics of rap/hip-hop music have migrated away from "hood politics" to gentler themes (McNulty-Finn, 2014)
  - Pop music has become more egocentric (Burgess, 2018)
  - Country music has slowly incorporated "energetic" features similar to rock/pop (Hight, 2018)
- Analyze changes in musical lyrics of Hip-Hop, Pop and Country music in the last 2-3 decades

Data Acquisition

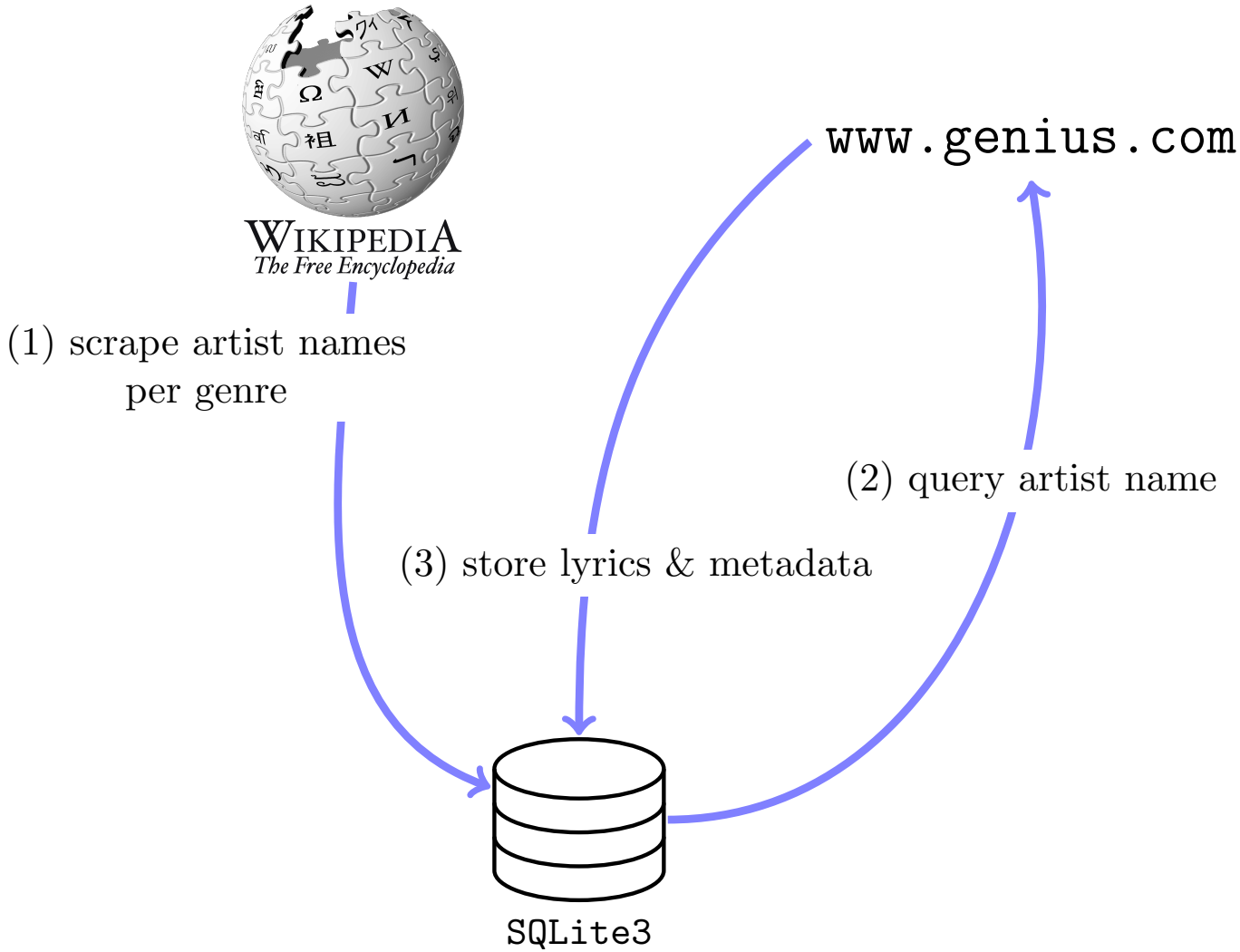

Fig. 1. Breakdown of data-scraping methodology using Wikipedia and the Genius API

Methodologies

- Data mining on both shallow and complex levels
- Shallow lexical features:
  - Frequent word analysis
  - Type Token Ratio (TTR)
  - Average word length
- Complex lexical/sentimental features:
  - Non-standard word frequency
  - Sentiment analysis using a supervised classifier

Evaluation

- Implement statistical tests to detect significant changes
- Change analysis in lexical features
  - TTR, average word length, non-standard words: t-test
  - Frequent word analysis: chi-squared (χ^2) test
- Change analysis in sentiment
  - Collapse and rank emotions in one dimension
  - Wilcoxon sign-rank test

Fell and Sporleder 2014

Lyrics-based Analysis and Classification of Music

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Abstract

We present a novel approach for analysing and classifying lyrics, experimenting both with n-gram models and more sophisticated features that model different dimensions of a song text, such as *vocabulary*, *style*, *semantics*, *orientation towards the world*, and *song structure*. We show that these can be combined with n-gram features to obtain performance gains on three different classification tasks: genre detection, distinguishing the best and the worst songs, and determining the approximate publication time of a song.

1 Introduction

The ever growing amount of music available on the internet calls for intelligent tools for browsing and searching music databases. Music recommendation and retrieval systems can aid users in finding music that is relevant to them. This typically requires automatic music analysis, e.g., classification according to genre, content or artist and song similarity. In addition, automatic music (and lyrics) analysis also offers potential benefits for musicology research, for instance, in the field of Sociomusicology where lyrics analysis is used to place a piece of music in its sociocultural context (Frith, 1988).

In principle, both the audio signal and the lyrics (if any exist) can be used to analyse a music piece (as well as additional data such as album reviews (Baumann et al., 2004)). In this paper, we focus on the contribution of the lyrics. Songwriters deploy unique stylistic devices to build their lyrics. Some of those can be measured automatically and we hypothesise that these are distinctive enough to identify song classes such as genre, song quality and publication time. There is, in fact, strong empirical evidence that it is worthwhile to look deeper into lyrical properties when analysing and classifying music. For example, it has been shown that classifiers that incorporate textual features outperform audio-only classifiers on most classification tasks (Mayer et al., 2008a; Mayer and Rauber, 2011; Li and Ogihara, 2004). Lyrics are also often easier to obtain and process than audio data, and non-musicians, in particular, often rely strongly on lyrics when interacting with a music retrieval system (Baumann and Klüter, 2002; Bainbridge et al., 2003). Moreover, lyrics do not only add semantic content, they can serve as an (easily observable) proxy for the melodic, structural and rhythmic properties of the audio signal. Melody and rhythm, for example, can often be traced in the stress pattern of the text (Nichols et al., 2009), while a song's overall structure is reflected in the order of textual elements such as chorus, verse and bridge. Psychological research also provides evidence the audio and textual content are indeed processed independently in the brain and hence are complementary for our appreciation of a song (Besson et al., 1998).

We extend previous research on lyrics-based song classification in two important ways: First, while earlier approaches mostly used fairly shallow textual features, such as bags-of-words, we designed features that model semantic and stylistic properties of lyrics at a much deeper level and show that these features can indeed be beneficial. Second, we address two novel classification tasks beyond genre detection, namely distinguishing 'best' and 'worst' songs[1] and determining the approximate publication time, and show that these can also be tackled by lyrics analysis.

[1]There is a growing body of work on automatic hit prediction but we would argue that this is a different task as hits are not necessarily qualitatively good songs and vice versa.

Proceedings of COLING 2014, the 25th International Conference on Computational Linguistics: Technical Papers, pages 620–631, Dublin, Ireland, August 23-29 2014.

- Fell and Sporleder (2014) presented a novel approach for analysing and classifying music
- Exploratory: experimenting with features, modelling semantic/stylistic properties:
  - POS tags, imagery, rhymes, TTR, word length (...)
- Various lyrics-mined features were used for classification tasks
- Lyrics-based feature mining deemed to be useful for classification tasks

Fell and Sporleder 2014 vs. Preliminary Results

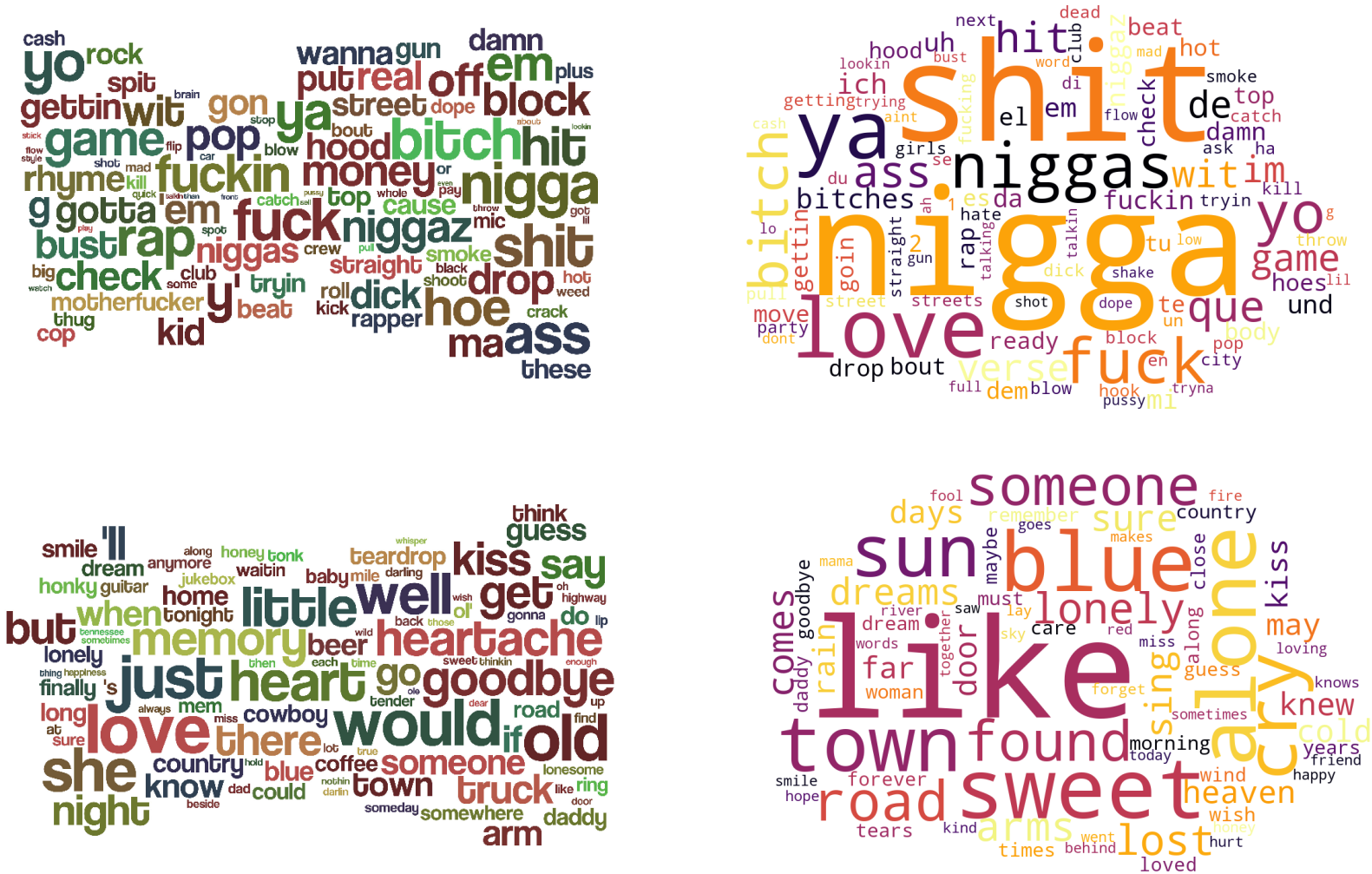

Fig. 2. Comparison of top most frequent 100 words in rap/hip-hop (top) and country (bottom) from Fell and Sporleder (2014) (left) and our methodologies (right)

Further Steps

- The approaches from Fell and Sporleder (2014) are useful for comparison and verification:
  - Can we replicate and expand their results with our approach?
- What meaningful information can we extract from novel results?
- Combined visualization of results such that genre evolution(s), or lack thereof, are salient

Questions?

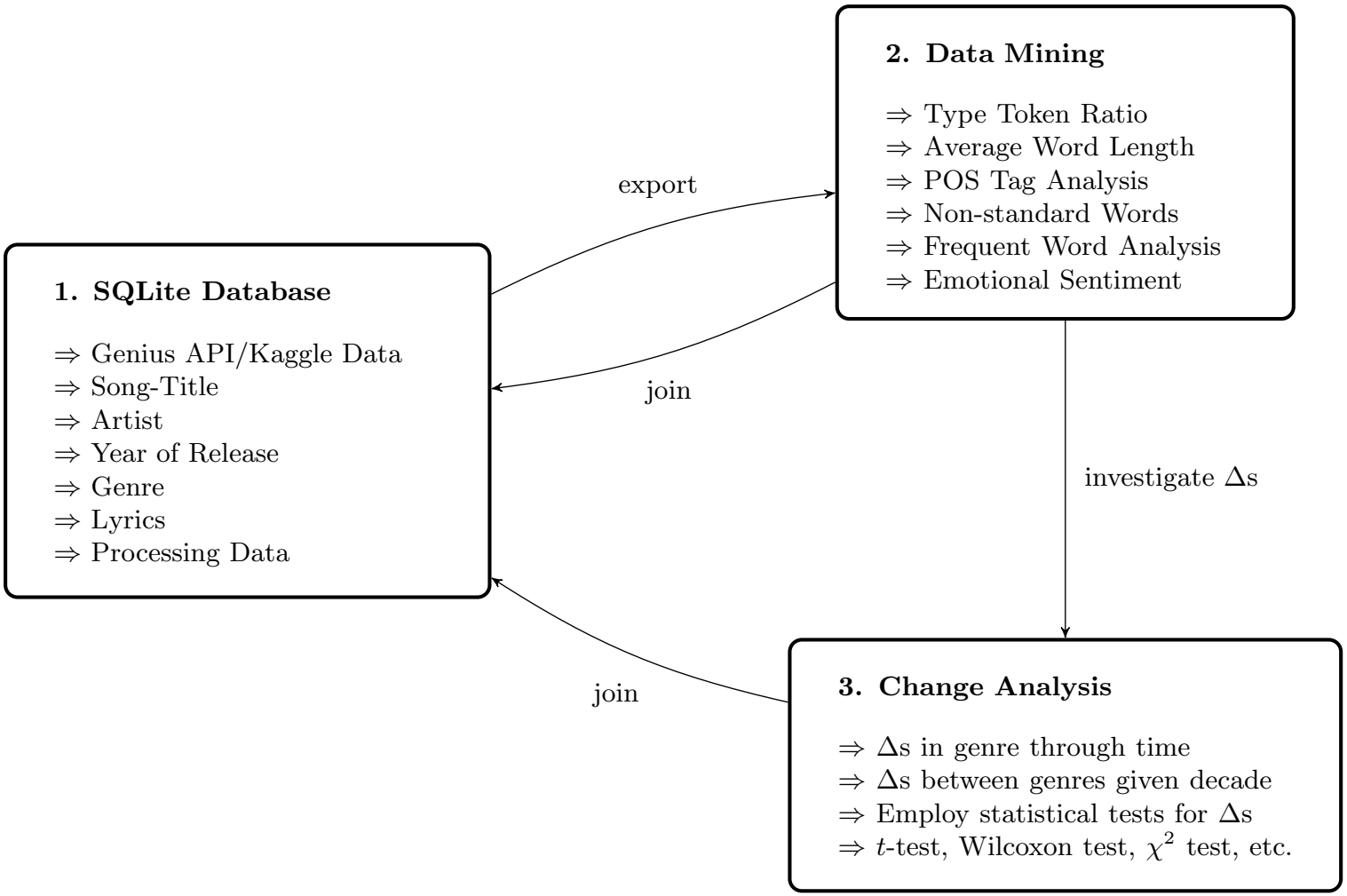

Fig. 3. Breakdown of project workflow and key moving parts

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