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Interdisciplinary opportunities and data-related challenges

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Music in newspapers: interdisciplinary opportunities and data-related challenges

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ABSTRACT

Over the past millennia, music has actively been performed and listened to by mankind, thus also playing an important role in establishing sociocultural identities that have evolved over time. In parallel, for many centuries, newspapers played an important role in informing society on a regular and frequent basis on topics noteworthy at that time. Therefore, in retrospect, these newspapers offer windows into historic topics of sociocultural significance, including cultural and musical life. Thanks to ongoing digitization efforts, large-scale newspaper corpora now have become broadly available and accessible. Taking the digitized historical newspaper collection of the National Library of The Netherlands as an example, in this paper, we discuss how considering music-related mentionings in newspapers can enable potential new research directions and questions. We discuss open syntactic and semantic data-related technical challenges when analyzing music-related mentionings in digitized historical newspaper collections. Finally, we discuss how successful detection of music-related mentionings can also benefit engagement of non-scholarly end users, concluding with an invitation to the interdisciplinary research community to actively contribute to the given use case.

CCS CONCEPTS

• **Applied computing** → **Arts and humanities; Digital libraries and archives**; *Law, social and behavioral sciences*; • **Information systems** → *Web searching and information discovery*; • **Social and professional topics** → *Cultural characteristics*;

KEYWORDS

music, newspapers, digital humanities, digital libraries, sociocultural significance, music information retrieval, enrichment

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1 INTRODUCTION

Over the past millennia, humankind has always performed and listened to music. This was not only confined to enjoyment in private spheres; instead, music frequently has had important public sociocultural functions too. Over time, composers and musicians played active roles in supporting the expression of religious praise and emphasizing social status of patrons [5]. Generally, in many cultures, music is actively being used as accompaniment to significant shared social experiences and activities [4]; in everyday listening, it frequently is used as a ‘technology of the self’ [11], moderating activity and self-established identity.

Continuous exposure to music and music-supported multimedia during important phases of our lives, combined with the social influence and preferences of our surroundings, influences our musical preferences [1, 3]. As for multimedia, music generally forms an essential part in shaping the narrative of persuasive media such as commercials and movies [2]. As a consequence of the continuous exposure, our musical taste and exposure profile may reveal sociodemographic and autobiographical characteristics [21, 30].

With the rise of the digital era, music consumption has been changing. Rather than being confined to fixed programming choices in a handful of radio stations, as individuals, we now have nearly unlimited access to any piece of music we would like. However, availability does not yet imply accessibility. With the overwhelming amount of potentially relevant items, digital search and recommendation tools have become a necessity to aid us in finding the content we wish to access. Over the past decades, the Music Information Retrieval (MIR) research field has focused on researching technology improving the digital accessibility of music items. However, the traditional MIR approach strongly has focused on music signal description for the purpose of collection indexing. Musicologists have criticized this approach, indicating that this considers very limited perspectives on musical content and meaning [34], and that many actively-researched computational MIR tasks tackle low-level ‘problems’ rather than higher level ‘questions’ [17]. Only recently, several works have emerged that more explicitly include user aspects, contextual usage and social taxonomies into MIR, e.g. [14, 16, 23, 24, 35], but these mostly have focused on contemporary popular music with larger-scale online consumption traces. In such larger-scale online consumption traces, comparatively little information is available on classical music consumption, both because of lower popularity and lower user activity on social media [25].

However, music that is not in the spotlights anymore today, may still have been significant in the past. Hints of this may be present in historical newspapers: offering periodical information on daily topics of significance to broad readerships, they provide windows into socioculturally significant phenomena over time, which will

also include music-related mentionings. Now such historical newspapers increasingly become available as digitized corpora, richer, more comprehensive, and more scalable insight into cultural life over the past centuries can be gained.

In this paper, we propose for digital historical newspaper data to be considered in relation to contextual music information research. Using examples from the historical newspaper collection of The National Library of The Netherlands (Koninklijke Bibliotheek, KB), we illustrate how this collection can provoke questions on how historical music items and music-related entities were 'naturally' consumed and perceived over time. Subsequently, we will discuss foreseen technical challenges, relating to retrieving meaningful music-related information from digitized newspaper corpora. Finally, we discuss how knowledge of music-related information in newspapers can also be interesting for non-scholarly usage scenarios, ending with a call to action to the community to support upcoming activities in this use case.

2 EXAMPLES FROM THE KB HISTORICAL NEWSPAPER COLLECTION

Over the past years, the KB has undertaken substantial effort in digitizing all newspapers that were published in The Netherlands, and making this information accessible to researchers. Presently, newspapers spanning nearly four centuries (from the years 1618–1995) can be accessed through the Delpher¹ portal, both as scans, and as transcripts based on Optical Character Recognition (OCR), amounting to over 12 million newspaper pages. This section give several examples of how information in this collection sheds light on historical musical consumption and perception, and what questions may be asked based on this.

2.1 New Releases

Similar to new releases that are advertised through music services and music stores today, historically, music stores have been advertising new musical offers through newspaper advertisements. Several historical examples of this are illustrated in Figure 1. Based on this information, a more comprehensive overview can be obtained on what new music was considered to be of significance. What music did music stores find worth mentioning to their customers? How were works described at conception time, and how does this contrast with the way we describe them today?

2.2 Concert Practice

Within the newspapers, concert programmes are regularly announced, as illustrated in Figures 2 and 3. These usually include performing musicians and work specifications. Based on this information, more understanding of concert practice in the pre-recording era can be obtained. What works were performed? Were only parts of these performed? Who performed them? How did the setting of a concert affect programming choices and description language?

2.3 Musicians as Notable Persons

Newspapers also provide rich insights into the image of musicians during their lifetime. How did they relate to their colleagues? How

Exemplaren compleet te bekomen zyn.
By E. VAN HARREVELT, Boekverkooper te Amsterd., in de St. Luciekerk, te bekomen: LA SERVANTE MAI TRESSE, MELEE D'ARIETTES & DE MUSIQUE TRADUIT DE LA SERVIA PADRONA INTER MEDII-TALIENI & wijk huijke daan dag alhier op d'Amsterdamsche Schouwburg zal gespeelt worden. By deselve is ook te bekomen: LA Maitresse de Musique Comedie, Pour le Theatre Hollandois Lettre no. idem en 10 Lettres completes.
te Amst. by de Boekverkoopers I. V. DAALLEN in de Staatstrat., en J. V. CLARENSTEYN op de Heylige Wog, is geprint en

(a) Amsterdamse courant, June 15, 1758. [6]

* By JOHAN JILLIUS HORNEL, in 't Groot Nieuw-Bazyn, op 't Ruck, over de Kapellekerk, te Amsterd., 1798 op Heeren te bekomen de volgende nieuw uitgekomen Musick-Works, als: Haydn's Opera, Op. no. 51. — Rapandje, Flute Quart. Op. no. 73. — Champlo Drey de la Melomanie, f. 2. — Scenisch d'na de clunense ou de Cid, f. 1. — Inlet voor het Cavaletto gongereert, Air Récit, le jamais le belle femme, par M. Parcellin, Trios en Française woerden met accordeon, 12 St. — Ouder de Pous des Pous de 2e. — Oper. Op. no. 100. — Glyceria Trios, met Flute & Violon. — Rhetor f. Trios, Act V. 1 en Viola en diverse nieuwe Opera Airs. — By hooftingelden zyn orde te bekomen alle werken van HLAAS de STRYK-INSTRUMENTEN, onder anderen Invenit. Trompetten met alle Toonen, Ghedone Clarinetten van diverse Toonen, en alle de Houten en Metalen. — Opera d'na, f. 1. — en Manon Lescaut, de F. C. — en de Clarinetten van diverse Toonen, en alle de Houten en Metalen. — Opera d'na, f. 1. — en Manon Lescaut, de F. C. — en de Clarinetten van diverse Toonen, en alle de Houten en Metalen.

(b) Amsterdamse courant, May 24, 1785. [7]

NIEUWE MUZYK by de GERRONPERS ABRAHAMS,
(Boekwinkel Langendijk.)
L'Inant, Principes de Lyr & de Guitre à six cordes, 12 St.
Glechant, Trois Dnes agréables pour deux Flutes, f. 2.
Gamine pour la Flute ordinaire, 8 St.
Pier, Ouverture d'Agnès pour le Piano-Forte, 16 St.
Beethoven, Variations pour le Piano-Forte, 14 St.
Durfel, Sonate posthume à 4 mains pour le Piano-Forte, f. 1.

(c) Middelburgsche courant, March 11, 1815. [9]

Figure 1: Examples of advertised new music releases.

STADS DOELEN TE DELFT
PROGRAMMA DER MUZIEKUITVOERINGEN,
te geven door de Muziekvereniging „De Delftsche Harmonie,”
bij gelegenheid der
Bloemen-Tentoonstelling van de Vereniging „FLORALIA,”
op Zondag 5 September 1880, 's middags 2 ure.
No. 1. Marsch; 2. Cavatine a/d. Oper. „Maria Stuart,” C. Reinhardt; 3. Floralia-Walzer, P. Versteeg; 4. Mendelssohn-scher Lieder, A. Oertel; 5. Ouverture „l'Elisir d'Amore, Donizetti; 6. Grande Polonaise, Schubert; 7. Souvenir de Campine, M. Krein; 8. Fantaisie Pastorale, P. Versteeg.
's Avonds ten 6 ure.
No. 1. Marsch; 2. Fantaisie „Fleurs du Bois,” W. v. Perk; 3. Floralia-Walzer, P. Versteeg; 4. L'Amitté, Polka, Händel; 5. Opera-Potpourri, P. Versteeg; 6. Das bild der Rose, G. Reichardt; 7. Finale a/d. Operette „Dorwürschen,” Reinhardt; 8. Pastouverture, A. Neibig; 9. Fantaisie Pastorale, P. Versteeg.

Figure 2: Delftsche courant, September 5, 1880: concert programme accompanying a local flower exhibition. [8]

were they perceived by reviewers and audiences? Beyond their music, what did newspapers find worthwhile to report on? For example, several early mentionings of composer and conductor Gustav Mahler do not focus on his music, but rather on the competition between him and Hans Richter regarding conductorship of the Vienna Philharmonic (e.g. [13, 20]).

2.4 Trends over Time

Beyond individual mentionings, aggregated analyses over longer time spans also will give insight into musical trends over time. Were today's musical key works and people actually also seen as key works and people in their own times? When were certain musical works and people particularly popular?

Two illustrations of this are given in Figure 4, visualizing relative frequencies of several names of operas and composers in the KB Newspaper ngram viewer corpus [10]². This corpus contains a representative subset of the presently available digital newspaper corpus, taking word ngrams from all newspapers from 1840–1995 that were digitized by 2013.

As can be noted, certain operas were frequently discussed in their own time (e.g. Gounod's 'Le tribut de Zamora', also prominently

¹<https://www.delpher.nl/>, accessed August 23, 2018.

²<http://lab.kb.nl/tool/newspaper-ngram-viewer>, accessed August 23, 2018.



Figure 3: Dagblad van Zuidholland en 's Gravenhage, July 18, 1869: programme of a charity concert. [32]

featuring in the novel 'Eline Vere' by Louis Couperus [15]), but are forgotten today. Also with composers, it is striking to note that general interest into Johann Sebastian Bach only truly emerged in The Netherlands over the course of the 20th century. Furthermore, going back to Gustav Mahler, in 1960 a sudden peak in mentioning frequency is found for his name, which can be explained by the centenary of his birth, and associated increased attention for his music.

3 DATA-RELATED CHALLENGES

The previous section gave various examples of how music-related mentionings in newspapers can be interesting to study. Indeed, work has already emerged along such lines. For example, in [26], a study is presented investigating music coverage in elite newspapers in four different European countries. Sampling articles from four reference years, 4,038 articles about music were manually coded, in order to examine coverage of classical vs. popular music, the relative occurrence of various musical sub-genres, and the newspaper article types in which music-related mentionings occur. Results illustrate how the cultural legitimacy of popular music grew over time, as reflected by coverage and the way in which the music is discussed.

Thanks to digital corpora and corresponding search and retrieval functionality, it will be possible to conduct similar endeavors in more comprehensive and scalable ways than can be done through manual sampling and coding alone. At the same time, several non-trivial technical challenges remain. In this section, we discuss several of these, again in connection to the KB newspaper collection.

3.1 How Much Music is in the Corpus?

While we assume that considerable music-related information is present in newspapers, we do not know how much of it is present

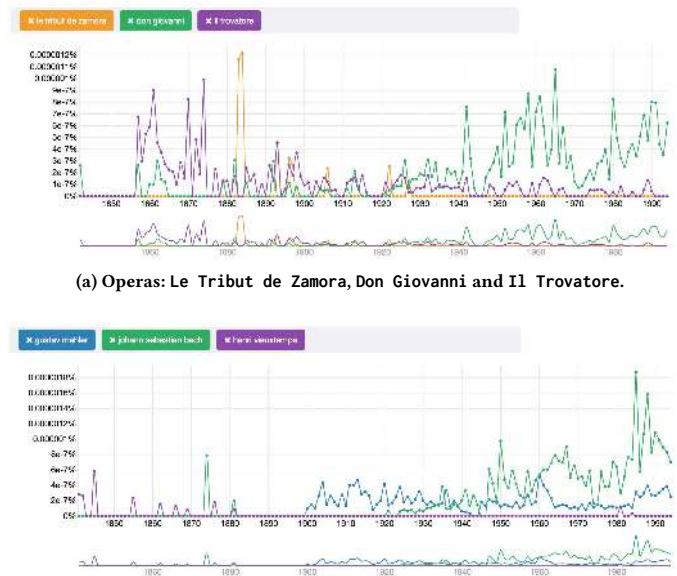


Figure 4: Relative naming frequencies over time in the Newspaper ngram viewer corpus [10].

exactly. In the HathiTrust Digital Library—another large-scale general digitized corpus, including content of potential musicological research interest—many volumes carry catalogue classifications that explicitly indicate that resources are indeed music-related [12]. No such metadata is available in the KB newspaper collection.

As one initial investigation into music-related coverage, we focused on musicians. More specifically, from the catalogue of CDR Muziekweb, the largest recorded music library in The Netherlands³, we extracted the names of people having at least one attribution as a composer in the CDR catalogue. This resulted in 21,791 unique names, which were used as plain text queries to the KB newspaper collection API. Considering the queries returning the largest amounts of article matches, and manually filtering for names that certainly consider a single person who was a musician⁴, Table 1 lists the 10 composer queries with the largest amounts of article matches. The results reflect considerable interest in Dutch people, who were both composers and active musicians during their lifetime. It should however be noted that the large amounts of article matches may be due to newspapers from the first half of the 20th century being strongly represented in the newspaper corpus. Furthermore, as will be discussed in the next subsection, OCR transcript quality influences matching success, which generally will be better for more recent articles.

3.2 Syntactic Challenges

OCR transcript quality of historical newspapers is known to be imperfect. As an example of representative content quality, Figure 5

³<https://www.muziekweb.nl/>, accessed August 23, 2018.

⁴e.g., matching article results for Baden Powell and Martin Luther very likely will not consider composers or musicians.

name	# articles	name	# articles
Willem Mengelberg	34,332	Willem van Otterloo	10,157
Richard Strauss	21,506	Theo van der Pas	8,475
Richard Wagner	18,975	Richard Tauber	8,447
Cesar Franck	14,382	Richard Hol	8,252
Willem Andriessen	10,986	Hugo Wolf	7,578

Table 1: Article match counts for composer name queries.

```

NIEUWE MUZYK bij de GEBROEDERS ABRAHAMS.
(Boekwinkel I. aOgendelft.)
T inrant, Principes de I yre & de Guitare 4 s 'x cordes, 12 St.
Ghcham , Trois Doos agrÃables pour deux Flute.i, f 2.
Gamme pour la Finte ordinaire, 8 St.
Paer, Ouverrore d'AgnÃise pour Ie Piano-Forte, 16 St.
Beethoven, Variations pour Ie Piano-Forte, 14 St.
Dusfek, Sonate posthumÃl 4 4 mains'poor Ie Pismo-Forte , f I.

```

Figure 5: OCR transcript of Figure 1c.

displays the OCR transcript for the advertisement displayed in Figure 1c. Formal, large-scale OCR quality assessment is an emerging topic of interest at the KB. However, only small annotated ground truth datasets are available so far [27]. As discussed in [27–29], OCR quality impacts document retrievability. Tokens with higher word-level confidence (which is positively influenced by successful matching to lists with known Dutch words) have higher retrievability scores [28]. Comparing OCR character error rates on newspapers from the 17th century vs. newspapers from the Second World War, the error rate is clearly higher for the 17th-century collection, negatively affecting retrievability of older articles [27].

In considering music-related mentionings, initial article matches can be obtained via trustworthy relevant queries (e.g. composer names, as used for Table 1). For such matches, raw OCR transcript data and corresponding visual content should be verified in more detail. As discussed in the next subsection, many common and relevant musical terms are not in Dutch, likely leading to lower word-level confidence assessments. Furthermore, domain knowledge is needed for understanding what alternative historical spelling variations should be taken into account in the music domain.

3.3 Semantic Challenges

Detecting music-related mentionings in historical newspaper data also is challenging at the semantic level for multiple reasons. First of all, the mentionings are inherently multilingual: even in a predominantly Dutch-language newspaper corpus, music-related vocabulary will frequently include Italian terms, while works may be referred to in German or French, as illustrated in Figures 1, 2 and 3. Furthermore, as mentioned in Section 2.1, works may have been (under)specified in different ways during their conception. For example, as illustrated in Figure 1b, Haydn’s works were originally described with an opus number, and as shown in Figure 1c, in some cases no opus number is present altogether. This will need flexible ways of item matching, as items may not be fully resolvable to a single identity according to standards such as the Music Ontology [22]. A promising direction will be to employ the Semantic Alignment and Linking Tool (SALT) [33] for item matching, and include musicological experts in deciding on appropriate matchings.

Named entities are frequently present in the query logs of the Delpher portal [27]. Generally, knowledge of named entities is

beneficial for linked and enriched data access. Therefore, the KB actively pursues Named Entity Recognition (NER) on the newspaper corpus [31]. So far, evaluation has been performed on a manually linked evaluation set of 349 named entities. With the NER initiative being intended for general-purpose linking, evaluation entities were not explicitly chosen to reflect music-related information. When seeking to recognize music-related mentionings, it will be worthwhile to establish a dedicated, domain-specific evaluation set, which should include domain knowledge on common multilingual musical item descriptions. Next to this, data-driven textual analyses may reveal common semantic resolutions at which musical works and music-related people are mentioned.

As a means to scale up quality improvements at the OCR and NER linking levels, the KB currently investigates crowdsourcing possibilities [27, 31]. This also will be a useful mechanism when seeking to engage music domain experts.

4 LOOKING FORWARD

In this paper, we discussed ways in which music-related mentionings in historical newspapers can provide richer insight into the sociocultural significance and contextualization of music over time. Beyond scholarly research, we believe that successful detection of music-related mentionings will also foster non-scholarly engagement with both newspaper corpora and music.

As discussed in [28], many of the millions of scanned newspaper pages may never have been accessed yet by a user. As discussed in this paper, many musical entities in the newspaper corpus may have been significant in their time, yet forgotten today. With the KB newspaper collection spanning four centuries, much of the music-related mentionings will consider classical music, which generally is an underconsumed genre today. As discussed in [18, 19], multimodal presentation and the inclusion of contextual background information can help making this genre more accessible to outsider audiences. Thus, we believe that successful linking of music-related mentionings and recorded music will offer novel enriched entrances to presently ‘forgotten’ items.

As we pinpointed, considerable technical challenges exist when considering the newspaper corpus in relation to musical information. When tackling these, both dedicated domain knowledge and data-driven solutions will be needed. With the paper, we would therefore like to explicitly invite research communities in MIR, Digital Libraries, Musicology and the broader Humanities and Social Sciences to take action and engage with the given use case, and jointly collaborate on ways to improve the accessibility of this material. We foresee this use case will trigger many new interdisciplinary research questions, and many new insights into description standards, as well as the historical consumption and perception development of non-mainstream cultural material.

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