

Hand in Hand; Strauss' Kaiser-Walzer as a case study of interdisciplinary collaboration in digital musicology

Chanda VanderHart ^{1,2,*}, David M. Weigl¹

¹Department of Music Acoustics – Wiener Klangstil, mdw – University of Music and Performing Arts Vienna, Anton-von-Webern-Platz 1, A-1030 Vienna, Austria

²Center for Applied Music Research, University for Continuing Education Krems, Dr.-Karl-Dorrek-Straße 30, 3500 Krems an der Donau, Austria

*Corresponding author: Center for Applied Music Research, University for Continuing Education Krems, Dr.-Karl-Dorrek-Straße 30, 3500 Krems an der Donau, Austria. Email: chanda.vander-hart@donau-uni.ac.at.

Abstract

Johann Strauss Jr.'s famous *Kaiser-Walzer* (Emperor Waltz) has provoked frequent study. Questions about its character, in light of the 'serious' versus 'art' music debate, have persisted over time since its inception in 1889. It still straddles both definitions in scholarship and popular understanding, and is among the most widely recognized works of the Strauss dynasty, frequently performed within the Vienna Philharmonic Orchestra's New Year's Concert (NYC) series. Interpretative choices made by orchestras associated with this music influence the conception of Vienna's 'signature sound', and differentiate Vienna's orchestras from national and international counterparts. The waltz's (intentionally) ambiguous naming presents a further mystery, long prompting discussion as to which Emperor was truly intended, Kaiser Franz Joseph I of Austria or the German Kaiser Wilhelm II. We approach these long-standing musicological questions using digital methods within 'Signature Sound Vienna', a research project funded by the Austrian Science Fund (FWF P 34664-G). Our interdisciplinary investigation of the NYC series combines historical and systematic musicology, performance science, music informatics, and Web science. Our data, organized according to FAIR principles as a Linked Data corpus, support machine-readable references underlying our assertions via publishable URIs. This article presents a case study, both of our musicological research (exemplified using the *Kaiser-Walzer*), and of this novel approach to scholarly publication (using URIs included within the reporting).

Keywords: digital musicology; close listening; music encoding; music recordings analysis; Vienna New Year's Concerts; linked data.

1. Introduction

Johann Strauss Jr. wrote *Kaiser-Walzer* (Emperor Waltz) op. 437, one of his most well-known and frequently discussed instrumental works, in 1889 ([Wiener Institut für Strauss-Forschung 2017](#)). It has provoked questions about whether it is serious or art music since its inception, and still straddles both definitions in scholarship and popular understanding today ([Linke 1987](#)). It is also one of the most frequently performed and widely recognized works of the Strauss dynasty¹; the interpretative choices made by orchestras linked most closely with this music are associated with Vienna's 'signature sound', and serve to differentiate Vienna's orchestras from their national and international counterparts. A further mystery is presented by the waltz's (intentionally) ambiguous naming, which has long prompted discussion as to which Emperor

was its true dedicatee, Kaiser Franz Joseph I of Austria or the German Kaiser Wilhelm II.

Fully engaging with these questions necessitates going beyond Strauss' composition as codified in the orchestral score, as its interpretation by performing musicians and curation by recording engineers is arguably at least as relevant to comprehensive understanding. We thus turn to collected concert recordings, drawn from the Vienna Philharmonic Orchestra's New Year's Concert series as well as from other notable national and international orchestras, including the Berlin Philharmonic, André Rieu's Dutch Johann Strauss Orchestra, the New York Philharmonic, and the Slovakian Philharmonic Orchestra and assembled in the course of a research project (see [Table 1](#)).

Our focus on interpretation elevates the relevance of such recordings to scholarship beyond the subordinate

Table 1. Recorded renditions of the Kaiser-Walzer within the Signature Sound Vienna corpus.

Context	Orchestra	Conductor	Year
New Year's Concert	Wiener Philharmoniker	Boskovsky	1975
New Year's Concert	Wiener Philharmoniker	Maazel	1982
New Year's Concert	Wiener Philharmoniker	Karajan	1987
New Year's Concert	Wiener Philharmoniker	Abbado	1991
New Year's Concert	Wiener Philharmoniker	Maazel	1996
New Year's Concert	Wiener Philharmoniker	Harnoncourt	2003
New Year's Concert	Wiener Philharmoniker	Pretre	2008
New Year's Concert	Wiener Philharmoniker	Jansons	2016
New Year's Concert	Wiener Philharmoniker	Muti	2021
Other	Staatskapelle Dresden	Böhm	1939
Other	Wiener Philharmoniker	Karajan	1946
Other	Wiener Philharmoniker	Furtwängler	1950
Other	Wiener Symphoniker	Stolz	1964?
Other	Wiener Symphoniker	Sawallisch	1967
Other	Wiener Volksopechorchester	Ohmachi	1976
Other	New York Philharmonics	Bernstein	1982
Other	Wiener Volksopechorchester	Bauer-Theussl	1983
Other	Berliner Philharmoniker	Karajan	1984
Other	Wiener Volksopechorchester	Falk	1988
Other	Wiener Johann Strauss Orchester	Boskovsky	1995
Other	Slovak Philharmonic	Aebi	1996
Other	Berliner Philharmoniker	Harnoncourt	1999
Other	Wiener Volksopechorchester	Michalski	2003
Other	Dutch Johann Strauss Orchestra	Rieu	2013
Other	Wiener Johann Strauss Orchester	Siebert	2015
Other	Wiener Johann Strauss Orchester	Eschwé	2016

position they have traditionally been afforded with respect to scores in most traditional musicology research (Leech-Wilkinson 2009). However, the systematic study of large collections of any particular composition's recorded performances presents its own challenges.

While we refer to 'concert' recordings, it is important to note that they are not straightforward, unmediated captures of singular performances. In fact, the bulk of the performance recordings in our collection, particularly including all New Year's Concert records, are each assembled from multiple performances across several dates, with additional fragmentary post-concert snippets recorded to ensure technical and musical consistency, as is typical when performance recordings are sold as products. As Mark Katz has argued in *Capturing Sound: How Technology Has Changed Music* (2004), such recordings exemplify the 'phonograph effect', whereby the microphone and recording process itself shapes both musical interpretation and the listener's experience. Though these recordings are often consumed as unified temporal events, they are, in fact, composite constructions. Recognizing this complexity is central to our approach: these recordings do not offer access to 'the performance' as it happened, but rather to a curated sonic artifact that reveals how performance style is framed, edited, and transmitted as part of the interpretive discourse.

Whereas music scores are visual media understood as frozen in time upon their publication and thus suited to holistic inspection, comparison, and analysis, audio recordings have a temporal dimension and can only be attended to one-at-a-time with considerable cognitive overhead.² The ephemeral impression of one recorded interpretation swiftly yields to that of another as soon as it is listened to, making comparative, analytical listening over large collections difficult. Cognitive overload quickly becomes an issue.

We grapple with this problem within the research context of 'Signature Sound Vienna', a research project investigating the Vienna Philharmonic Orchestra's New Year's Concert series from an interdisciplinary perspective combining methods, approaches and research questions from historical and systematic musicology, performance science, music informatics, and Web science. To analyse differences between renditions in order to clarify our understanding of the degrees of interpretative licence taken both within the Vienna Philharmonic's long history of performing these works and also by other orchestras, we have gathered an extensive collection of commercial recordings spanning the history of the concert series and incorporating other contemporary examples. Following recent trends in digital musicology research (Weigl *et al.* 2021), this collection has been digitized and organized according to the FAIR principles for scientific

data management, with the intent of producing a sustainable, reusable resource of relevance beyond the immediate confines of the research project (Weigl *et al.* 2022).

An advantage of this interdisciplinary context is that approaches from musicology and informatics are mutually informative, with musicological concerns driving the creation of digital tooling, which often prompt new research questions, in turn driving further iterative, scholarly processes. These digital musicology workflows have led to the creation of software tooling within the project to aid in negotiating the complexities of our corpus, which includes not only dozens of recordings of each work (for the Kaiser-Walzer, see Table 1), but also digital score encodings in the semantically-rich format of the Music Encoding Initiative or ‘MEI’ (Krabbe and Geertinger 2012), as well as references to discourse items, concert programmes, bibliographic and discographic metadata, audio feature data, and annotations captured as structured Linked Data. Software tools developed within our project include ‘mei-friend’, a browser-based editor for MEI encodings (Goebel and Weigl 2024), ‘Listen Here!’ (Weigl *et al.* 2023) a tool facilitating comparative close listening across collections of audio- and score-aligned recordings, and the ‘Primal’ Platform for Reviewing and Interacting with Music Annotation Linked-data. These tools and their underlying data models are Web-native, requiring no installation and enabling their integration using Linked Open Data. All evidence objects and associated research outcomes thus become citable using URIs, simplifying their inclusion as references in reporting, such as in the present article.

The ‘Listen Here!’ tool was used to efficiently conduct close listening across the collected recordings. The tool provides the ability to switch seamlessly between recordings during playback, and to place markers at musical locations of interest, which are projected to all renditions’ recordings at the appropriate place, allowing rapid iterative playback of the marked location(s) in each rendition.

Audio-to-audio and audio-to-score alignment supporting this tooling was conducted using the SyncToolbox package,³ which implements a set of dynamic time warping algorithms. To support the audio-to-score alignment process, the historical Breitkopf and Hertel edition of the orchestral score (No. 3288; ca. 1890s–1920s; Plate 30200) was encoded in the MEI format⁴ using mei-friend. In order to handle differences in the repeat structure across different recorded interpretations of this waltz, we categorized each version (Table 2), identifying four different structural configurations in our set⁵ and encoding these as <expansion> elements with the MEI (Listing 1):

most commonly, only the fourth waltz is repeated; occasionally (New York Philharmonic under Bernstein 1982; Berlin Philharmonic under Harnoncourt 1999; and in the New Year’s Concerts 2003 under Harnoncourt and 2021 under Muti the second waltz also is repeated; and, as explored below, the coda is sometimes ignored (‘Ballsprung’), with the fourth-waltz repeat included (Rieu’s Dutch Johann Strauss Orchestra in 2013) or neglected (Sächsische Staatskapelle Dresden under Böhm 1939; Vienna Philharmonic under Karajan 1946). As our alignment reference, we chose the structurally most extensive version, in its most recent rendition by the Vienna Philharmonic Orchestra (New Year’s Concert under Muti 2021).

Listen Here! is also capable of importing music score annotations adhering to the Music Annotation Ontology (Lewis *et al.* 2022), automatically associating them with the corresponding time intervals in each recording. Such annotations may be authored directly on the score using the ‘mei-friend’ editor. Users are able to click and drag on the visual score representation to select score elements, and may annotate these using a dedicated panel. With this process, the editor is capable of producing in-line annotations (as MEI <annot> elements) as well as stand-off, Linked Data annotations adhering to the Web Annotation and Music Annotation Ontology data models. While the modelling of scholarly claims is an ongoing subject of research and more sophisticated process-specific ontologies (e.g. Sanfilippo, Freedman, and Mosca 2025) are available, our chosen combination of data models provides an expedient fit for the development of browser-based applications centred on MEI and Linked Data.

The stand-off annotations allow our tools to be used in combination: score locations annotated in mei-friend provide a music-semantic index to annotate corresponding parts of the audio renditions for close listening in the Listen Here! tool. As Linked Data, the resulting annotations each have their own URI which may be dereferenced by a machine agent (e.g. a piece of analytical software) to recover the underlying data. When the same URI is retrieved in a Web browser, the Primal tool is used to provide human-readable, attractive views of the combined evidence objects tied together in these machine-readable structures. These views surface textual commentary, annotated digital music score fragments, interactive waveform visualizations, data model views, and Linked Data code listings. These are presented in sections, beginning with the more accessible information (text, scores, audio), and followed by the more technical information (graph visualization, code listing). Each section is accessible from a fixed navigation menu, simplifying comparison. An illustration of the graph visualization, presenting a

Table 2. Structural configurations of the repetitions in our set of recorded renditions.

Context	Orchestra	Conductor	Year	W2-repeat	W4-repeat	W4-dalSegno	Ballsprung
New Year's Concert	Wiener Philharmoniker	Boskovsky	1975	No	Yes	No	No
New Year's Concert	Wiener Philharmoniker	Maazel	1982	No	Yes	No	No
New Year's Concert	Wiener Philharmoniker	Karajan	1987	No	Yes	No	No
New Year's Concert	Wiener Philharmoniker	Abbado	1991	No	Yes	No	No
New Year's Concert	Wiener Philharmoniker	Maazel	1996	No	Yes	No	No
New Year's Concert	Wiener Philharmoniker	Harnoncourt	2003	Yes	Yes	No	No
New Year's Concert	Wiener Philharmoniker	Pretre	2008	No	Yes	No	No
New Year's Concert	Wiener Philharmoniker	Jansons	2016	No	Yes	No	No
New Year's Concert	Wiener Philharmoniker	Muti	2021	Yes	Yes	No	No
Other	Staatskapelle Dresden	Karl Böhm	1939	No	No/NA	No/NA	Yes/NA
Other	Wiener Philharmoniker	Karajan	1946	No	No	No	Yes
Other	Wiener Philharmoniker	Furtwängler	1950	No	No	No	No
Other	Wiener Symphoniker	Stolz	1964?	No	Yes	No	No
Other	Wiener Symphoniker	Sawallisch	1967	No	Yes	No	No
Other	Wiener Volksopechorchester	Ohmachi	1976	No	Yes	No	No
Other	New York Philharmonics	Bernstein	1982	Yes	Yes	No	No
Other	Wiener Volksopechorchester	Bauer-Theussl	1983	No	Yes	No	No
Other	Berliner Philharmoniker	Karajan	1984	No	Yes	No	No
Other	Wiener Volksopechorchester	Falk	1988	No	Yes	No	No
Other	Wiener Johann Strauss Orchester	Boskovsky	1995	No	Yes	No	No
Other	Slovak Philharmonic	Aebi	1996	No	Yes	No	No
Other	Berliner Philharmoniker	Harnoncourt	1999	Yes	Yes	No	No
Other	Wiener Volksopechorchester	Michalski	2003	No	Yes	No	No
Other	Dutch Johann Strauss Orchestra	Rieu	2013	No	Yes	No	Yes/NA
Other	Wiener Johann Strauss Orchester	Siebert	2015	No	Yes	No	No
Other	Wiener Johann Strauss Orchester	Eschwé	2016	No	Yes	No	No

```
<expansion xml: id = 'Long_Version_Harnoncourt' plist = '#Introduktion #Walzer1 #Walzer2-withRep #Walzer3 #Walzer4-withRep-woDalSegno #Coda #Ballsprung #Tempo_di_Valse'/>
<expansion xml: id = 'Short_Version_Boskovsky' plist = '#Introduktion #Walzer1 #Walzer2 #Walzer3 #Walzer4-withRep-woDalSegno #Coda #Ballsprung #Tempo_di_Valse'/>
```

Listing 1. The MEI `expansion` element encodes how sections of the score may be programmatically expanded into 'through-composed' form, e.g., to reflect interpretive structural choices during a performance. The list of identifiers associated with each `expansion`'s `plist` attribute specifies which sections are to be included, and in which order.

summarized view of the underlying data model for Example C in this article, is presented in Fig. 1.

Each of these tools is developed as open-source software (AGPL-3.0 license) and available as a publicly-hosted Web application.⁶ As all resources, including annotations, are identified by URIs, additional information enriching these resources (as well as further annotations) may be created and distributed by project-external scholars; and, since the tools integrate with one-another on the basis of a shared, cross-compatible data model, rather than through code-level integration, project-external tools adhering to the Music Annotation Ontology may be applied.

One significant hurdle is presented by the commercial nature of the recordings that are the focus of this research. Although our data model allows for the precise specification of time intervals within specified recordings in relation to our assertions, copyright restrictions prevent us from directly sharing this audio in many cases. To compensate, where providing audio is not permitted, we instead publish audio visualization data (waveform peaks) derived from the recording. This allows us to display the audio in an

equivalent way, including markup visualizing annotated intervals. As playback is not possible in these cases, information identifying the commercial recording (including links to streaming platforms where available) is provided. This limitation to access of audio is particularly significant when examining works like Strauss' Kaiser-Walzer, whose interpretive history is entangled not only with musical practice but with broader cultural and aesthetic debates.

2. Symphonic (serious) work or (popular) dance music?

One such debate, raised implicitly or explicitly when it comes to Strauss-dynasty waltzes, particularly within the setting of the New Years' Concert Series, is where they fall within the popular and so-called 'serious' music divide. The separation of music and music performance into these two categories still informs the institutional divisions between historical musicology and popular music studies, and also profoundly impacts their organization today; in the German-speaking world, '*E(rnste)*' and '*U(nterhaltungsmusik)*'

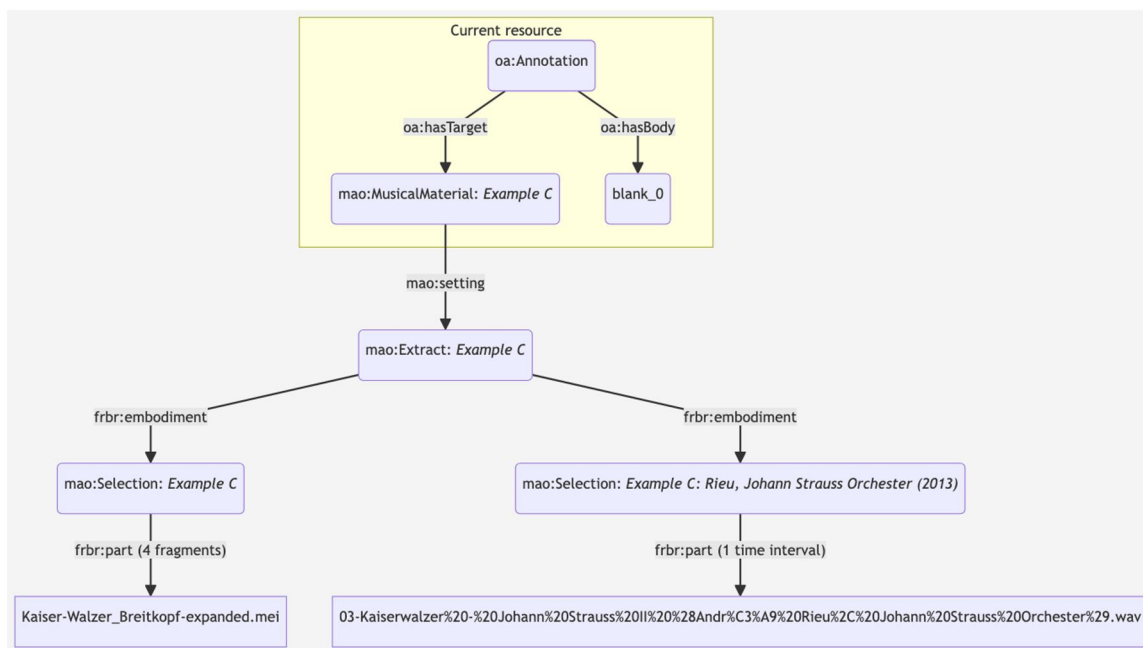


Figure 1. Graph visualization from the Primal view of Example C in the reporting below, available at <https://w3id.org/ssv/hand/annot/oa/ExampleC>. The image illustrates how a *musicological object*—a Web Annotation including textual commentary—is associated with a *music object* structure comprising *musical material*, *extract*, and *selections* in score (MEI) and audio, adhering to the Music Annotation Ontology (Lewis et al. 2022).

concerts are even categorized separately in entertainment listings. Strauss-dynasty music has been positioned ambiguously within these debates, and is designated as ‘symphonische Unterhaltungsmusik’ [symphonic light/entertainment music] in current scholarship, a term which itself attempts to have it both ways (Saary 2002). In the ongoing debate, which intensified during the twentieth century, the Strauss family was largely relegated to *Unterhaltungsmusik*, and therefore discussed only peripherally in consideration with many contemporaries, despite their closely related histories, performance programming, and sound worlds.⁷

By most metrics, Strauss-dynasty waltzes and polkas are classified as popular music.⁸ They were regularly composed to evoke ephemeral events, specific places, or popular fads, from birthdays or ascensions of members of the royalty to the popularity of the so-called pleasure trains [*Vergnügungszüge*]. The Strauss orchestras were commercial in nature, not funded by a specific governing body or bound to a location. Their survival was dependent on generating income through performances and sheet music sales; they were therefore led by charismatic entrepreneurs and performed for the masses in outdoor pavilions and at balls as well as in concert halls, theatres, etc. (Spitzer 2008). This music was not envisioned as exclusively Absolute or Abstract Music, like a symphony or the string quartet,

nor was it designed solely to edify through performance in a quiet concert hall, but instead seen first as functional, convivial music to which people danced, mingled, and chatted (Dahlhaus 1991: 18).

Yet Christa Brüstle points out that by the 1860s, contemporary audiences understood these waltzes as ‘works’—concert music to sit and listen to actively—not exclusively as dance music, noting that at this time new waltzes were first listened through by a seated or standing audience before they were danced, and also that they were referred to as a holistic composition. The Kaiser-Walzer, which contains four waltzes strung together into the so-called *Walzerkette* [chain of waltzes] plus an introduction and coda, was no longer spoken of in the plural *von den Walzern* [of the Waltzes] but referenced as a singular composition, *von dem Walzer* [of the Waltz] (Brüstle 1995: 158–72).⁹ While music scholars did not initially focus seriously on Strauss family music, other writers have long tried to thread the needle, generally admitting the popular nature of these compositions, but simultaneously arguing for the Strausses’ particular ‘genius’, either aligning their music with other, less-contested ‘serious’ composers in the canon, or pointing out formal or stylistic aspects of the score that seemed relevant.¹⁰

Looking beyond the scores, as we do here, and examining Strauss-dynasty pieces in the context of their most famous performed interpretations today, the

‘Ernste’ and ‘Unterhaltungsmusik’ discussion gets even muddier. There is a more recent tendency in scholarship which—fairly convincingly—argues that the nature of this popular/‘art’ divide has been fundamentally transformed and its lines blurred to a considerable degree beginning in the 1950s, particularly with the rise of recording technologies and new metrics for tracking popularity (i.e. charts, sales data).¹¹ The New Year’s Concert series is a rich text in this light. The series features one of the world’s most renowned classical orchestras, the Vienna Philharmonic, and they perform in the *Musikverein*, a literally golden ‘temple’ to the Arts, considered since its construction in 1870 to be one of the most prestigious venues for classical ‘art’ performance. In many households and countries, watching these televised concerts, broadcast internationally by Arts and Culture channels on New Year’s Day, functions broadly as a class signifier; it is perceived as a high-end, culturally-rich viewing option.

By the same token, the New Year’s Concert series is clearly a product distributed to the masses, unabashedly commercial in nature, and linked to technology; characteristics which are consistently viewed—in German language scholarship—as central, separating popular music from ‘Art’ (Adorno 1941; Dahlhaus 1967; von Appen, Grosch, and Pfeleiderer 2014: 200–9). On a financial level, these events are broadcast to millions around the world who watch it on television from their living rooms and kitchens on New Year’s Day, generating an exorbitant amount of wealth for the ensemble. Their DVD and CD recordings top the charts each year, repeatedly going gold or platinum, and those awards are displayed on the walls of Vienna’s *Haus der Musik* in an exhibition curated in collaboration with, and dedicated to, the Vienna Philharmonic Orchestra, hung like they would be on the walls of a pop-star’s record label or flaunted by a booking agent.

While score-based study and scrutiny of distribution practices are interesting ways of engaging with this popular/functional/light music or art/symphonic/serious music debate, we can also study the evolution of performances over time to gain insights. Here, we use the case study of the Kaiser-Walzer, one of the Strauss dynasty’s most frequently performed works. Since its premiere in 1889, this waltz has remained one of the widely performed works within the New Years’ Concerts series since their inception in 1941.¹² Investigating how the Kaiser-Walzer has been realized in performance (i.e. how its performance recordings differ from each other over time) offers a novel layer of insight into the coexistence of aspects fundamental to both the so-called ‘popular’ and ‘art’ concepts. Here we focus on three aspects of the work and its

recordings, namely the composition’s structure and how it is realized in performance, the treatment of the Introduction and Coda sections, and the performance style of the extended cello solo within the Coda.

The expansion of Introductions and Codas in waltzes, initiated by both Strauss Sr. and his contemporary, Josef Lanner, was a practice built upon by Strauss Jr. beginning in the 1860s. This indicates that these waltzes were no longer seen merely as a series of simple dance pieces, but combined into larger, cohesive works. Andreas Ballstaedt (in Finscher and Riethmüller 1996) points out that initially the introduction was little more than a brief signal to the audience that the waltz was about to start—a call to dance—yet introductions to waltzes like Strauss Jr.’s *Künstlerleben*, op. 316, dating from 1867, is not only a substantial 39 bars long but anticipates three of the constituent waltzes, even blending two of their themes together in novel ways.

In the 1880s, Strauss Jr. took this artistic elaboration to new extremes in the Kaiser-Walzer where the Coda alone comprises nearly 40 per cent of the waltz’s total length, cycles through themes from each of the previous constituent waltzes, and employs instrumental solos which would be difficult to dance through due to significant shifts in volume and tempo. This was remarked upon from its inception, the press quickly taking notice—and aim—purporting that Strauss intended to make the waltz too modern, with one journalist accusing him of wanting to slow down the *Tempo di valse* to an *Andante comodo*. In an open letter in the press, ghostwritten by Eduard Hanslick, Strauss replied, ‘It has never occurred to me, and will never occur to me, to slow down the tempo of the waltz even the slightest [...] In my most recent works, “Kaiser-Walzer” and “Rathausball-Tänze” I have only extended the Introduction and Coda, and occasionally mentioned to friends that these sections might be capable of further development.’¹³

Examining our collected recordings, this idea of a more ‘symphonic’ expansion has seemingly been further elaborated over the years by major orchestras, with their performances increasingly distanced from the waltz’s danced origins over time. To illustrate, in our earliest recordings, a 1939 version of the Staatskapelle Dresden conducted by Karl Böhm, a 1946 studio rendition of the Vienna Philharmonic Orchestra under Herbert von Karajan, and a 1950 recording with the Vienna Philharmonic Orchestra under Wilhelm Furtwängler, the baseline tempi of Introductions and Codas are each considerably quicker than in later years (<https://w3id.org/ssv/hand/annot/oa/ExampleA>). In addition, in both pre-mid-century cases, the Coda is simply not performed. In the 1939 recording, the work ends abruptly following the

third constituent waltz, at bar 255, and in 1946, the Philharmoniker likewise took a modified version of the so-called ‘*Ballsprung*’, an optional ending written in by Strauss for when the waltz was being actively danced. Taking this cut avoids the necessary rhythm breaks built into Strauss’ Codas, which are—unlike the internal, constituent waltzes—much more difficult to dance to. After Waltz 4 the Philharmoniker jump directly from bar 454 to the final twelve bars of the piece. In contrast, in all later recordings, which all fall in the second half of the 20th century or in the 21st, no cuts whatsoever are taken to the Coda; the *Ballsprung* is apparently no longer considered a suitable performance option.

If one wanted to play devil’s advocate, one could argue that these earlier recordings were studio recordings and therefore perhaps subject to time restrictions imposed by early recording medium capacity. That being said, over time a tendency to greater expansion is noticeable, easily observed in the treatment of the first cello solo which takes place during the final nine bars of the Introduction. Examining solely the many Vienna Philharmonic Orchestra recordings, this cello solo is, in the 1946 recording, not only played by the entire section instead of a single cellist, but is played through at a fairly steady tempo, similar to what came before. Beginning in 1975, the solo becomes an actual solo; a lone cellist performs this part. It also grows into an increasingly highlighted, performative moment which demonstrably slows and expands over the years. To illustrate: (<https://w3id.org/ssv/hand/annot/oa/ExampleB>).

The shifting interpretation of this section over the performance history of the Neujahrskonzert thus continues the stretching and expansion of the Coda initiated by Strauss Sr. and elaborated by Strauss Jr. Orchestras continuing, in effect, to extend Strauss’ already expansive Kaiser-Walzer Coda is an indication that the association with actual dance practice has become increasingly overtaken by the idea of this composition as a ‘serious’ concert work. Although both taking the Coda or ignoring it were viable options which co-existed side by side in Strauss’ day, after the mid-20th-century the *Ballsprung* has become functionally obsolete in high-end recordings; within the New Year’s Concert series, it would be unthinkable to skip the Coda today. Moreover, the increasingly slowed cello solo can perhaps be understood as a performative insistence that this music should be considered symphonic (i.e. high art), not functional (i.e. popular).

3. Vienna’s signature sound

Viennese orchestras are associated with a unique sound and style, the study of which has been the

subject of prior research; academic departments were founded and a wealth of study dedicated to Vienna’s unique horns, oboes and kettledrums, as well as extensive experiments conducted to see how recognizable particularities of that sound/style are (Widholm 1990a; Widholm 1990b; Sonneck and Widholm 1995: 139–42; Bertsch 2001, 2002, 2003). Perusing our corpus with the help of assistive tooling, there are several categories where obvious distinctions can be made between the Vienna Philharmonic and other orchestras, from Vienna and elsewhere, in terms of how the Kaiser-Walzer was performed. These categories include instrumentation, colour, rubato, tuning, articulation, and formal structure.

Notably, many original Strauss manuscripts have been lost to history. Those which survived are not consistent with their instrumentation, as orchestral size and make-up varied widely. In the words of Michael Rot, editor of the New Johann Strauss Complete Edition, ‘We can assume that the instrumentation and overall size of the orchestra for a given performance influenced the decision [of who played what], otherwise it was left to individual players.’¹⁴ Rubey (1999) and Aigner (2003) have laid out in detail the size of the various Strauss family ensembles, which varied widely depending on the event and location, but also established that the instrumentation remained fairly standard and was simply minimized when the number of players was reduced. Variation was, therefore, generally limited to percussion and to how many strings, woodwinds, etc. should play which parts. The general instrumentation of strings (first and second violin, viola, cello, and contrabass), woodwinds (flute, oboe, clarinet, bassoon), brass (horns, trumpets, trombones), harp, and percussion was standard and still is in all performances by the Austrian orchestras in our corpus. However, other orchestras take more liberties, most considerably André Rieu’s Johann Strauss Orchestra in their recording, ‘*Das große Neujahrskonzert*’, released in 2013. Rieu used baroque flute throughout, adding it noticeably to the clarinet line in the Introduction (<https://w3id.org/ssv/hand/annot/oa/ExampleC>), which gives a completely different colour than the muted solo clarinets. In the beginning of Waltz 1, the oboe is replaced by these flutes, while the harp line is performed instead by glockenspiel (<https://w3id.org/ssv/hand/annot/oa/ExampleD>). Finally, Rieu employs a piano, which is particularly noticeable in the second waltz as it thumps away, consistently doubling the basses as well as—at times—both winds and strings. (<https://w3id.org/ssv/hand/annot/oa/ExampleE>).

In terms of rubato, while there are subtle interpretative variations between all performances, there are norms in terms of how phrases are moved or which beats are held a bit longer or cut a bit shorter respected by Viennese orchestras more or less across the board

to differing degrees. The ‘cheating’ in waltzes—the second beat coming a bit early and the third beat slightly late—is the most well-known Viennese waltz characteristic, and gives the waltz its particular *Schwung*. There are, however, also dramatic choices made by other non-Viennese orchestras to insert a fermata on a certain note, to slow down, to leave empty space and/or rush through a phrase which no Viennese orchestra—the Vienna Philharmonic Orchestra, the Volksoper Orchestra, the Vienna Symphony Orchestra, or the Vienna Johann Strauss Orchestra—takes. One such moment is at the beginning of Waltz 4. In the final measure before the waltz commences, most orchestras take an unwritten fermata on the second beat, extending the dotted quarter by a good margin. Thereafter, Viennese orchestras move the phrase directionally *into* the *forte* downbeat of the third bar (bar 262). Most do this by pulling the tempo gradually back just slightly in the bar before, while a few take the phrase nearly in-tempo, driving directly *into* the downbeat, but in all cases, the phrase *leads* to that downbeat as a mini-climax. Not so the Tyrolian K&K Philharmonie under Matthias Georg Kendlinger. In their 2010 recording, after an extensive fermata, they play bars 260 and 261 very quickly and steadily, then insert a completely unprepared caesura right before the downbeat both in the first listening and in the repetition: (<https://w3id.org/ssv/hand/annot/oa/ExampleF>).

Beyond these differences in tempo and rubato, the ability to immediately juxtapose recordings offered by the ‘Listen Here!’ tool also brings to the fore differences in orchestral tuning. There is a wealth of scholarship focused on historical tuning, which has varied considerably depending on region, and generally risen over time, despite efforts to universalize concert pitch (Haynes 2002). In contrast, pitch inflation, as it has been termed, over the course of the 20th and into the 21st century, has remained comparatively unthematized. Although it is common industry knowledge that most orchestras in European countries, especially the German-speaking world, tune slightly higher than American orchestras, which lie somewhere around $A = 440$ Hz and $A = 442$ Hz, depending on the orchestra, to the average listener, this would not be obvious. However, jumping directly from a recording of the New York Philharmonic in 1982 and concurrent performances by the Berlin Philharmonic and the Vienna Volksoper Orchestra, for example, makes the shift explicit: (<https://w3id.org/ssv/hand/annot/oa/ExampleG>).

More surprisingly, the Philharmoniker themselves seem to have steadily raised their tuning over time. While reported ranges of standard concert tuning, with concert A set between 440 Hz and 444 Hz around the mid-20th century, appear to be the norm, the Vienna Philharmonic has been reported to tune as

high as 448 Hz when playing in the *Musikverein*.¹⁵ Comparing recordings from 1946, 1975, 1991, and 2016, for example, is illustrative: (<https://w3id.org/ssv/hand/annot/oa/ExampleH>).

Such interpretive choices—whether in rubato, instrumentation, or tuning—demonstrate how style and expressive nuance differ between orchestras and across decades. But performances also vary in terms of their structure: not only how a waltz sounds, but which parts of it are repeated or even included in performance.

In this context, our listening tool also proved helpful in identifying structural variation across performances. It allowed us to quickly verify and even discover differences in how various expansions or contractions—systematically embedded as repeats, *dal segnos*, or optional cuts within Strauss waltzes—were executed. One example is the *Ballsprung*, generally used when the work is being danced to (i.e. to avoid the slow cello solo discussed in the previous section). Another reason to cut would be to fit a recording onto a restrictive physical medium. In the case of the Kaiser-Walzer, the *Ballsprung* appears in bar 454, right before the *più meno* that precedes the cello solo, and indicates a jump to the downbeat of bar 490, whereafter the final 21 bars are then played as written to close. In both our earliest recordings, of the Staatskapelle Dresden from 1939 and the Philharmoniker from 1946, there are *Ballsprünge* taken, although neither is as indicated in the score. The Dresden recording conducted by Karl Böhm simply ends completely at the close of Waltz 3, at the end of bar 255, while the Vienna Philharmonic under Herbert von Karajan jumps directly from the *Ballsprung* indication in bar 454, but only plays the final 12 bars of the piece to close, not the full 21 indicated (<https://w3id.org/ssv/hand/annot/oa/ExampleI>).

As for the many other repeat signs in the score, there is only one way in which the New Years’ Concert recordings of the Vienna Philharmonic Orchestra vary, and that is whether or not they take the repeat in Waltz 2. While both the recordings with Nikolaus Harnoncourt in 2003 and Riccardo Muti in 2021 include the repeat, in all other years it is omitted. Notably, Harnoncourt takes the repeat as well in his recording with the Berlin Philharmonic from 1999, as does Leonard Bernstein with the New York Philharmonic in 1982.

One final formal anomaly is worthy of mention, and features again in the 2013 recording of André Rieu and his Holland-based Johann Strauss Orchestra, not to be confused with the Vienna Johann Strauss Orchestra. From bar forty-nine until the cello solo in bar sixty-seven, there is an inexplicable cut. Likewise, in the parallel section in the Coda, a cut is inserted from the double barline in measure 247 directly to the

solo section beginning in bar 472 (<https://w3id.org/ssv/hand/annot/oa/ExampleJ>).

Clearly, there are established differences. In no way, however, should pointing to stylistic differences within and outside of Vienna be understood as evidence supporting essentialist narratives. There has been a long-standing, unfortunate, and lingering tradition of discussing Viennese music as being played a certain way by the Viennese because they have innate musical/stylistic knowledge and ability simply due to their Viennese-ness—ostensibly inheriting it genetically through blood or DNA, or perhaps soaking it up organically like plants by drinking Austrian water from birth.¹⁶ There is clear evidence that Viennese orchestras are and have been multinational, and birthright is simply not how musical culture or performance style is transmitted. There is much more reason to assume differences have everything to do with music socialization and exposure, a thread we are exploring in ongoing research.

These performance decisions reflect not only evolving aesthetic preferences, but also shifting associations around the Kaiser-Walzer itself—musical, national, and political. To fully appreciate the implications of how the piece has been interpreted and received, we must turn to the broader cultural and historical context in which it was created and performed.

4. The Emperor wears which clothes?

Composed on the occasion of Austrian Franz Joseph I's visit to Prussian Wilhelm II and one year after the Austrian emperor's jubilee, the Kaiser-Walzer has long provoked the question of whom the waltz was primarily intended for. In addition, this composition has been used consistently over the years to musically evoke what were alternatively understood as Austrian/Habsburg or German/Prussian characteristics.

Impassioned arguments for the waltz' intended dedicatee have long been made on either side, citing evidence both historical and musical (Ritter 1892; Rubey 1994; Suchet 2015). Originally titled 'Hand in Hand' by Strauss, Simrock, his Berlin-based publisher chose the title under which it was published, 'Kaiser-Walzer' [Emperor Waltz], which the Prussians would understand as meaning their young ruler, Wilhelm II. Yet the publication, when it first appeared in print for the public as a piano reduction, bore a cover illustration featuring the Austrian Imperial Crown, which would appeal to the Viennese, doubtless a savvy marketing choice.¹⁷ The waltz premiered first in Berlin at the *Königsbau* on 21 October. Performed by an orchestra of 100, it was a brilliant success and had to be repeated twice *da capo* according to the *Neue Freie Presse* (23 October 1889, p. 6). It debuted in Vienna the

following month at the *Musikverein*, on 24 November (*Neues Wiener Tagblatt*, 24 November 1889, p. 13). Formally, the work opens with a march, a Prussian nod, but includes four waltzes, a Viennese trademark, the third of which, however, features a memorably percussive, lead-booted theme, evocative of the stereotype of a Prussian martial mindset.

The contemporary press in Vienna remarked from the outset on the dual aspects of the work. A review in the *Deutsche Musik-Zeitung* (Vol. 31, 1889, p. 3) titled '*Neue Tanzmusik*' [New Dance-Music] contains this telling passage:

The Waltz King names his latest opus 'Kaiser-Waltz', just published by Simrock, the publisher of Brahms, Bruch, etc. The capital city of the new German emperors indeed attracts everything! Thankfully, the only Berliner aspect of the waltz is its publisher. While Strauss may give a nod to the creators of universal conscription with some march rhythms in the Introduction, as soon as the triple metre begins, he speaks his dear, genuine Viennese, which is maintained until the very end.

And after the waltz's Viennese premiere in the *Musikverein*, the *Die Presse* critic (26 November 1889, p. 11) described the waltz as a dancing couple, with the Prussian man charmed by the feminine grace of his Viennese lady:

Strauss had to play his 'Kaiser Waltz' three times, and with each repetition, the enthusiasm of the audience grew. A pianissimo march, faintly echoing from afar, which forms the Introduction of the waltz, seems to allude to the armed peace of the allied powers on the Spree and the Danube—the waltz is written in Vienna for Berlin and was performed for the first time in the capital of the German Empire just a few weeks ago under the composer's direction. But already, the enticing melody of the first waltz beckons eagerly and promisingly to the warlike crowd as if with white feminine arms. The Prussian, colossally dashing guard lieutenant lays down his sword in the cloakroom and offers his arm to the most beautiful Viennese lady for a tour around the hall. Half promenading, half dancing, exchanging eloquent glances and handshakes, perhaps also whispering tenderly and caressing, the young couple floats along until the dance, which brought the fortunate ones together, separates them again. Each carries their love's dream in their heart and continues the interrupted encounter. The delicate, poetic Coda knows how to tell of it.

Well into the 20th century, the waltz was subject to further readings and attributions; all seeking to evoke either something particularly Habsburg or understood as quintessential symbols of German-ness. Zoë Alexis Lang, who outlined much of this dispute in her own Emperor Waltz case study (Lang 2014: 30–62), points out that this very ambiguity is perhaps what has made the work so frequently co-opted to evoke a particular national feeling. ‘What might seem to be an inconsequential question of intention produced a piece that could be adopted—or adapted—by those wishing to find either a German or an Austrian tone within it,’ Lang writes. The waltz was arranged by Schoenberg in 1921 to wistfully look back to a bygone, fading Austrian monarchy, then later rebranded as part of Nazi propaganda to glorify unified *Deutschtum* with an added, openly jingoistic text by Maria Volderauer-Schöpfer for the third waltz in an arrangement by Hans Heinz Scholtys.¹⁸ Musical elements perceived as (stereo)typically Prussian (i.e. ‘martial’: dotted rhythms, heavy downwards beats, percussive snare licks, downwards musical impetus to which a person would march) and Viennese (i.e. ‘sentimental’/‘waltz-like’: rubato-filled melodic lines, lightness of sound, early second and late third beats in $\frac{3}{4}$ time to which a person would waltz) have been cited to support either side of the discussion. Even the extra-musical cultural context is ambiguous and has shifted depending on circumstance. Films including *The Last Emperor* as well as three movies titled *Emperor Waltz* give the work varied implications.

Engaging with this rich background of scholarly discourse and socio-political context, we turn again to recorded performances, adding a historically underutilized approach to standard score analysis (Cook 2013). Can we determine, through close and distant listening, whether this waltz more saliently evokes, as Suchet (2015: 200) argues at great length, ‘the character of Emperor Franz Joseph; a military man, but a quiet one’ or reflects the German emperor or purported German musicality through its form, as program notes from the Vienna Philharmonic’s New Year’s Concerts in *Anschluss* times persistently purport, where the waltz is described as ‘a symphonic waltz ... intended for the German emperor’ (Schneider 1939/1940). Peter Kemp’s reading that the title was left purposely vague by Simrock to ‘satisfy the vanity of both monarchs’ (Kemp 1985: 126) could only be confirmed by Strauss—posthumously—himself. The best we can do today is to study the performance recordings in the hope of determining the reading towards which the performers at the time were more inclined.

Interlinking score encodings with collections of aligned performance recordings allows us to examine

broader interpretative changes over time. When comparing aspects (e.g. temporal profiles, dynamics, timbre, mastering) in recordings by the Vienna and Berlin Philharmonics, the initial assumption was that Berlin would adopt a more stereotypically Prussian, militaristic style and Vienna highlight the carefree, waltz-like *Schwung*. However, comparing recordings by Austrian or German orchestras between the 1930s through the end of the 1960s to those by either orchestra since the late 1980s, there appears to be a noticeable diminishment across the board of more martially-coded musical elements over time.

To illustrate this at its most extreme, we can look first at the most lead-booted section of the composition, namely the B-section in Waltz 3. Here, trumpets, trombones, bassoons, and cellos take the melody beginning in bar 223, accompanied by snare rolls and heavy contrabass half-notes on the downbeats. The rest of the orchestra plays upbeats on the second and third beats, and the first violins play a light, eighth-note counter melody. If we listen to the recordings from the Vienna Philharmonic Orchestra from 1946 under Herbert von Karajan to the 1975 under Willi Boskovsky, or to the Staatskapelle Dresden with Karl Böhm from 1939, the tempi are all comparatively quick and exact, and the percussion thunderous. (<https://w3id.org/ssv/hand/annot/oa/ExampleK>.) Over time, tempi slow and for the Vienna Philharmonic Orchestra, more than a touch of Viennese ‘*Schwung*’ becomes the norm, even in this heavily martial section. This is most noticeable in recordings such as the New Year’s Concert from 2021 with Franz Welser-Möst or from 2008 with George Prêtre; in both, the swing is so pronounced, the percussion so muted, and the inner voices brought out to such a degree that the theme would be more at home at a child’s Ferris-wheel ride than calling anyone into battle. This mollification is not limited to the Philharmoniker in Vienna; the Berlin Philharmonic in 1984 under Herbert von Karajan hardly swing, but their tempo is relaxed and the brass theme is performed so lyrically in comparison that the theme registers as charming and tuneful, instead of edgy and strident. (<https://w3id.org/ssv/hand/annot/oa/ExampleL>.)

From performances, it is clear that the overarching tendency has been to focus on less militaristic themes over time. Why would this be? Perhaps this tendency further reflects a movement away from the functional dance association; clearly, cueing a mass of waltzers as to when to drive their leading foot into the ground is certainly less important in a formal concert setting than it is in a dance hall. Perhaps, however, this is instead or also a reflection of changes and trends in recording technology over time. Without recounting the entire history of recording and how the chain of audio processing has evolved, tendencies towards increased

normalization and compression are evident, which likewise might take some of the militaristic heft out of the mastered audio. This might further tie in with the increasingly ‘artistic’ presentation and branding of this music—extremes in volume are the purview of rock and punk, and associated with emotional extremes, not appropriate to polite behaviour associated with the concert-going elite. This trend may be driven by the growing renommée of the New Year’s Concert series over time and how this cultural institution continues to shape audiences’ understanding of Strauss-dynasty compositions, including more hefty works such as the Kaiser-Walzer.

5. On digital musicology as a research approach

This investigation, focused on the Kaiser-Walzer, itself represents a case-study of a digital musicology workflow incorporating FAIR research data and assistive technologies. It offers new insights into research questions of interest to musicology, without claiming or aiming to supplant other approaches. Far from replacing traditional music scholarship and research methods, this digital approach augments and enriches these by both facilitating the testing of research questions, both on larger corpora—in this case of audio recordings—and by providing novel vantage points and simultaneously broader and more immediate ways of observing them.

Our Linked Data model enables us to formalize the assertions backing our reported observations, anchored explicitly into the strata of evidence (i.e. encoded scores, audio recordings) at a highly granular resolution. While copyright restrictions prevent the full publication of our audio corpus, we continue to investigate possibilities of making this accessible to the public—through a combination of *in situ* installations in institutions (e.g. museums) with corresponding site licences, references to materials distributed via commercial platforms, and stand-in representations conveying the most salient aspects of the recordings without violating copyright. The use of Linked Data facilitates the inclusion of references to our explicitly modelled assertions within reporting, as we have done in this article. Through the use of so-called content negotiation, the links provided may be accessed through a Web browser to obtain a human-readable view using the Primal interface developed for this purpose, but also through a standard HTTP-based interface by machine agents seeking to process this data in machine-readable form. We anticipate the tools and workflows developed within our project to be applicable to future research and publication, thereby supporting further case studies combining these interdisciplinary interests and heterogeneous media sources.

Acknowledgements

For the purpose of open access, the authors have applied a CC BY public copyright licence to any Author Accepted Manuscript version arising from this submission. We thank Günter Stummvoll for musicological feedback, our project advisors Profs. Werner Goebel, Markus Grassl, and Fritz Trümpi for their guidance, and student assistants Delilah Rammner and Matthäus Pescoller for their valuable contributions.

Author contributions

Chanda VanderHart (Conceptualization, Investigation, Methodology, Writing—original draft, Writing—review & editing), David M. Weigl (Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Software, Supervision, Writing—review & editing).

Funding

This research was funded in whole by the Austrian Science Fund (FWF) (DOI: 10.55776/P34664). Its publication is supported by the Open Access Funds of the mdw – University of Music and Performing Arts Vienna and by the University for Continuing Education Krems.

Notes

1. Dynasty is a term used incessantly in both popular discussion and media representations of the Strausses. Although in formal definition ‘dynasty’ implies intergenerational political power, it here indicates both the long-term perpetuation of Strauss-family cultural capital in combination with its requirement for scions to maintain legitimacy over time, characteristics of traditional dynasties thematized by historian Jeroen Duindam (2019).
2. Of course, despite describing scores as ‘frozen in time’ in contrast to the temporal nature of listening, it is important to acknowledge that audio recordings, too, represent a form of inscription—translating ephemeral sound into a repeatable, analyzable object. As Glenn Gould argued in his influential 1966 essay, the recording medium enables not only the possibility of hearing the same performance multiple times, but also encourages new forms of interpretation shaped by the conditions of production and playback. Recordings are thus not neutral documents but artifacts which actively shape musical meaning, performance practice, and listening habits (Gould 1966; Katz 2004; Philip 2004). While the technical histories of the recordings studied here are not always fully traceable—especially in older examples—their role as curated, edited, and technologically mediated artifacts remains central to our approach.
3. The SyncToolbox package is available under the public MIT license at <https://github.com/meinardmueller/synctoolbox>. Our custom scripts which apply this package to collections of audio recordings and MEI files are available under the same license at <https://github.com/Signature-Sound-Vienna/alignment>.
4. The encoding is available in different expanded structures under the public Creative Commons Attribution (CC BY) 4.0 license at https://github.com/Signature-Sound-Vienna/Johann-Strauss-Sohn-Op437_Kaiser-Walzer_Breitkopf.

5. This structural variability reflects broader historical practice. Strauss waltzes, like many other nineteenth-century dance forms, were composed as sequences of several modular sections, the so-called chain of waltzes, which included flexible repeat patterns that performers could adapt for social or practical contexts, plus introductions and transitional sections. Originally intended to accompany dancing, these works were soon designed to be extensible—repeats could be added or omitted depending on the flow of a ball and in later contexts, adapted to suit concert listening durations. For example, in the context of the Strauss family performances, often a waltz would first be listened to by the seated audience, then danced to.
6. The mei-friend editor is available at <https://mei-friend.mdw.ac.at>, with extensive documentation at <https://mei-friend.github.io>. Listen Here! is available at <https://listen-here.mdw.ac.at>. The Primal viewer is hosted at <https://primal.mdw.ac.at>. Code for all tooling is available under the public A-GPL 3.0 license: mei-friend at <https://github.com/mei-friend/mei-friend>, Listen Here! at <https://github.com/Signature-Sound-Vienna/listenHere>, and Primal at <https://github.com/Signature-Sound-Vienna/primal>.
7. ‘At the same time, [Strauss family music] became an unfortunate victim of an increasingly pernicious divide in music historiography between serious and light music, *Ernstmusik* [sic] and *Unterhaltungsmusik*.’ David Wyn Jones, *The Strauss Dynasty and Habsburg Vienna* (Cambridge University Press, June 2023). See also Finscher and Riethmüller’s introduction to their anthology *Johann Strauss: zwischen Kunstsanspruch und Volksvergnügen* Darmstadt: Wissenschaftliche Buchgesellschaft, 1995: ‘Man kann wohl ohne Übertreibung sagen, daß Johann Strauss für die gegenwärtige Musikwissenschaft so gut wie nicht mehr existiert’ [one can state without exaggeration that Johann Strauss practically no longer exists for current musicology.] This has been remedied in the last decades, with Strauss’ music, correspondence, and biographies taken seriously in studies by cultural studies scholars and musicologists including David Wyn Jones, Andreas Ballstaedt, Franz Endler, Norbert Linke, Derek B. Scott, Peter Kemp, Zoe Alexis Lang and extensively analysed and categorized by Norbert Rubey, Franz Mailer, Michael Rot, Günter Stummvoll, and Thomas Aigner. For an in-depth discussion of the tenuous place of Strauss music in discourse, multiple articles in the Finscher & Riethmüller Strauss anthology are particularly useful.
8. Defining popular music or *Populärmusik* or *Populäre Musik*—particularly in a historical sense—is itself hardly straightforward. See the introduction to Ralf von Appen, Nils Grosch, and Martin Pfeleiderer, ‘Populäre Musik: Geschichte-Kontexte-Forschungsperspektiven’, Laaber, 2014, 7–11. See also Peter Wicke, ‘Populäre Musik als theoretisches Konzept’, *Humboldt-Universität zu Berlin, PopScriptum* 10, 1992: 6–42.
9. In actuality, this shift likely occurred earlier; already in 1857, Josef Strauss’ ‘Perlen der Liebe’ Op. 39 is titled ‘Concert-Walzer’, just one indication that the waltz was not exclusively something to be danced, but to be listened to in a concert setting. See Günter Stummvoll’s Introduction to *Perlen der Liebe Partitur und kritischer Bericht*; Zentrum für Angewandte Musikforschung, Donau-Universität Krems. Hollitzer 2020: 7–9.
10. See also *Musik aus Wien: Die Geschichte einer Weltbezauberung*, where author Alexander Witeschnik discusses Strauss Jr.’s contributions to the waltz, including the ‘*Veredelung der Form, der Vertiefung des Inhalts*’ [the ennoblement of the form, the enriching of the content], introducing and depicting him alongside Johannes Brahms, Franz Schubert, Johann Sebastian Bach, Richard Wagner, and Anton Bruckner pp. 305–7.
11. Relevant here is the research by *Sonderforschungsbereich* (SFB) 1472 ‘*Transformationen des Populären*’ at the University of Siegen and by C:POP, the Transdisciplinary Research Center for Popular Music Cultures and Creative Economies in Paderborn for the past 20 years.
12. The Kaiser-Walzer is the fifth-most-frequently-performed composition in the New Year’s Concert series, featuring within the concert programmes of 19 performances. To place it in context, the most frequently performed composition—the Blue Danube Waltz—has featured in eighty-two New Year’s Concerts to date, almost exclusively as an encore in connection with the Radetzky March (in second place with seventy-eight years at time of writing).
13. From the *Neue Freie Presse*, 5 March 1860, cited in translation in Kemp 1985, 125–126.
14. See Michael Rot (Trans. Elizabeth Robinson), introduction to critical Kaiser-Walzer edition, iii.
15. Fred T. Abdella, ‘As Pitch in Opera Rises, So Does Debate’, *The New York Times*, *The New York Times*, August 1989.
16. To give one egregious example, Kurt Diemann Dichtl, in the third chapter, ‘*Wiener Blut; Das goldene Orchester*’ [Viennese Blood; the Golden Orchestra] of his 1996 book on Vienna’s signature sound writes, ‘What is that? You could call it tradition. Musical culture has expressed itself in a certain form. This is what Vienna sounds like, and I believe Austria has nothing more valuable to export than its glorious orchestra.’ He likewise cites William Furtwängler as purporting, ‘What is it that ultimately distinguishes this orchestra from others? What gives it its unique position in the European music world? [...] I see the reason for their exceptional position in the fact that the Philharmoniker—as paradoxical as it may sound at first—are exclusively a Viennese orchestra. With very few exceptions, its individual members really are Viennese. Most of them were also born in Vienna, at least they were brought up here and have worked here since their youth. It is the Viennese school of flutes, oboes and clarinets, the Viennese bassoons, horns, brass, percussion and strings from which the individual members of this orchestra all come, without exception, from the Viennese school and tradition. This entire multi-headed apparatus, this band of virtuosos of the highest order, are all sons of a single landscape, a single city. There is no other like it in the world. No other city in the world offers such diverse musical possibilities, none has proven to be as productive of music as Vienna’ (author’s translation) in Diemann-Dichtl, 1996: 36.
17. See David Wyn Jones, ‘Johann Strauss’s Emperor Waltz. A Cover Story’, *FifteenEightyFour* | Cambridge University Press, June 2023.
18. Notably, Strauss’s own lineage was similarly ‘purified’ by NS ideologies—see also <https://www.johann-strauss.at/en/forschung/forschungssplitter/faelschungsgeschichte/>.

Data availability

The data underlying this article are available in Zenodo at <https://doi.org/10.5281/zenodo.16639718> and from the GitHub repository at <https://github.com/Signature-Sound-Vienna/data>. Links to all software, source code, and the MEI encoding of the Kaiser-Walzer are provided in the Notes, above.

References

- Adorno, T. (1941) *On Popular Music*. Studies in Philosophy and Social Science 9, no. 1, pp. 17–48. New York: Institute of Social Research.
- Aigner, T. (2003) ‘Besetzung, Stärke und Qualität der Strausskapelle’, in *Die Fledermaus, Wiener Institut für Strauß-Forschung*, pp. 281–88. Mitteilungen 14-17. Tutzing; Hans Schneider.
- Bertsch, M. (2001) ‘Vibration Patterns and Sound Analysis of the Viennese timpani’, in D. Stanzial (ed.) *Proceedings ISMA*, pp. 281–284. Perugia: Musical and Architectural Acoustics Lab, FSSG-CNR Venezia.
- Bertsch, M. (2002) ‘Can you identify the Vienna Philharmonic Orchestra, compared with the Berlin or New York Philharmonic?’ *CD-Dokumentation des Forums Acusticum Sevilla*.

- Bertsch, M. (2003) *Wiener Klangstil—Mythos oder Realität?* Schriftenreihe des Instituts für Musikalische Akustik der Universität für Musik und darstellende Kunst Wien.
- Brüstle, C. (1995) Johann Strauss in der Diskussion in Finscher & Riethmüller (eds).
- Cook, N. (2013) *Beyond the Score: Music as Performance*. Oxford University Press.
- Dahlhaus, C. (1991) *The Idea of Absolute Music*. University of Chicago Press.
- Dahlhaus, C. et al. (1967) *Studien zur Trivialmusik im 19. Jahrhundert*. Bosse.
- Dieman-Dichtl, K. (1996) *Wiens Goldener Klang: Geschichten um die Wiener Philharmoniker und Ihr Neujahrskonzert*. Amalthea.
- Duindam, J. (2019) *Dynasty: A Very Short Introduction*. Oxford: Oxford Academic. Oxford University Press.
- Finscher, L., and Riethmüller, A. (1996) *Johann Strauss. Zwischen Kunstanspruch und Volksvergnügen*. Wissenschaftliche Buchgesellschaft (wbg). Rubrik: Bücher.
- Goebel, W., and Weigl, D. M. (2024) 'mei-friend: An Interactive Web-based Editor for Digital Music Encodings', *Journal of Open Source Software*, 9: 6002. <https://doi.org/10.21105/joss.06002>
- Gould, G. 'The Prospects of Recording.' *High Fidelity Magazine*, 1966. Reprinted in *Audio Culture: Readings in Modern Music*, C. Cox and D. Warner (eds), Continuum, 2004.
- Haynes, B. (2002) *A History of Performing Pitch: The Story of 'A'*. Lanham, MD: Scarecrow Press.
- Jones, D. W. (2023a) 'Johann Strauss's Emperor Waltz. A Cover Story', in *FifteenEightyFour*. Cambridge, UK: Cambridge University Press.
- Jones, D. W. (2023b) *The Strauss Dynasty and Habsburg Vienna*. Cambridge, UK: Cambridge University Press.
- Katz, M. (2004) *Capturing Sound: How Technology Has Changed Music*. Berkeley: University of California Press.
- Kemp, P. (1985) *The Strauss Family: Portrait of a Musical Dynasty*. UK: Baton Press.
- Krabbe, N., and Geertinger, A. T. (2012) 'MEI (Music Encoding Initiative) as a Basis for Thematic Catalogues. Thoughts, Experiences, and Preliminary Results', in *RISM Conference: Music Documentation in Libraries, Scholarship, and Practice*, Frankfurt am Main: Répertoire International des Sources Musicales.
- Lang, Z. A. (2014) *The Legacy of Johann Strauss: Political Influence and Twentieth-Century Identity*. Cambridge, UK: Cambridge University Press.
- Leech-Wilkinson, D. (2009) *The Changing Sound of Music: Approaches to Studying Recorded Musical Performance*. CHARM. <https://www.charm.rhul.ac.uk/studies/chapters/intro.html>, Ch. 1.2.1., §20.
- Lewis, D. et al. (2022) 'A Model for Annotating Musical Versions and Arrangements Across Multiple Documents and Media', in L. Pugin (ed.) *Proceedings of the 9th International Conference on Digital Libraries for Musicology (DLfM '22)*, pp. 10–18. New York, NY: Association for Computing Machinery. <https://doi.org/10.1145/3543882.3543891>
- Linke, N. (1987) *Musik erobert die Welt*. Vienna: Herold.
- Philip, R. (2004) *Performing Music in the Age of Recording*. New Haven, CT: Yale University Press.
- Ritter, W. (1892) *Les dernières oeuvres de Johann Strauss*. Gand.
- Rubey, N. (1994) *Johann Strauss (Sohn): Geschichte in Musik*. Vienna: Norbert Rubey.
- Rubey, N. (1999) 'Johann Strauß mit seinem eigenem Orchester Personale', in Strauß J. (ed.) *Unter Donner und Blitz. Catalogue and Accompanying Text to the 251st Special Exhibition of the Historisches Museum der Stadt Wien*, pp. 227–31. Vienna: Historisches Museum der Stadt Wien.
- Saary, M. (2002) 'Unterhaltungsmusik, symphonische', *Österreichisches Musiklexikon Online*. Vienna: Verlag der Österreichischen Akademie der Wissenschaften. <https://doi.org/10.1553/0x0007bcdd>
- Sanfilippo, E. M., Freedman, R., and Mosca, A. (2025) 'Ontological Modeling of Music and Musicological Claims. A Case Study in Early Music', *International Journal on Digital Libraries*, 26: 10.
- Sonneck, G., and Widholm, G. (1995) 'On the Sound of Horns and Oboes-Typical Properties of Viennese Orchestras', in A. Melka, J. Stepánek, and Z. Otčenášek (eds.) *Speech-Music-Hearing, Proceedings of the 32nd Czech Conference on Acoustics*, pp. 139–142. Prague: VUZORT.
- Spitzer, J. (2008) 'The Entrepreneur-Conductors and Their Orchestras', *Nineteenth-Century Music Review*, 5: 3–24.
- Suchet, J. (2015) *The Last Waltz: The Strauss Dynasty and Vienna*. London: Elliott & Thompson.
- von Appen, R., Grosch, N., and Pfeiderer, M. (2014) *Populäre Musik: Geschichte—Kontexte—Forschungsperspektiven*. Laaber.
- Weigl, D. M. et al. (2021) 'FAIR Interconnection and Enrichment of Public-Domain Music Resources on the Web', *Empirical Musicology Review*, 16: 16–33.
- Weigl, D. M. et al. (2022) 'The Vienna Philharmonic Orchestra's New Year's Concerts: Building a FAIR Data Corpus for Musicology', in *Proceedings of the 9th International Conference on Digital Libraries for Musicology*, pp. 36–40. DLfM'22. New York, NY: Association for Computing Machinery.
- Weigl, D. M. et al. (2023) 'Listen Here! A Web-Native Digital Musicology Environment for Machine-Assisted Close Listening', in *Proceedings of the 10th International Conference on Digital Libraries for Musicology*, pp. 109–118. DLfM '23. New York, NY: Association for Computing Machinery.
- Wicke, P. (1992) *Populäre Musik als theoretisches Konzept*. Humboldt-Universität zu Berlin, PopScriptum 10.
- Widholm, G. (1990a) *Das Wiener Horn. Sein Klang—seine Spieltechnik*. Musik-Symposium Schloß Schlosshof.
- Widholm, G. (1990b) *The sound characteristic of the Vienna philharmonic orchestra investigated with digital measuring methods*. *Audio Engineering Society Convention* 88.
- Wiener Institut für Strauss-Forschung (2017), *Strauss-Elementar-Verzeichnis 9: Thematisch-Bibliographischer Katalog der Werke von Johann Strauss*. Vienna: Hollitzer Wissenschaftsverlag.

© The Author(s) 2026. Published by Oxford University Press on behalf of EADH.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted reuse, distribution, and reproduction in any medium, provided the original work is properly cited.

Digital Scholarship in the Humanities, 2026, 41, 294–306

<https://doi.org/10.1093/llc/fqaf093>

Full Paper