

Introduction

In the feverish rise of interdisciplinary endeavors, scientific proceedings, journals, conferences, project groups, and other institutional formations, are increasingly moving away from explicit *disciplinary* boundaries. Progressively, they are opening up their space to multidisciplinary projects, yet “workers in one discipline are not always aware of what is happening in some of the others.”¹ This issue of the Proceedings of Musicology is dedicated to highlighting the integrative aspirations of contemporary musicological research, in particular activities in the field of computer-assisted music research.

Music research is carried out in different domains. In relation to cognitive studies, the medium of music is used as a secondary or central concept to investigate cognitive and emotional processes, while many social science studies consider music as a sociocultural, socio-economic, or purely historical phenomenon. A good part of musicological activity treats music as a focal structure, conceived by the very internal arrangement of notational-symbolic (or sonic) matter, without the inclusion of external musical phenomena. In addition to foundations of music theory (in particular, the various approaches and theories of music analysis), the methodological assumptions of acoustics, mathematics, iconography, and so on, are increasingly being applied to music analysis. Even if the theoretical basis in such approaches is usually tailored to the individual research case, nowadays, many of these are increasingly turning to the use of computational tools in their methodology.

What commenced as experiments of technological capabilities in the field of computer-assisted music research, evolved over time into a whole new institutional discipline or, better still, a group of sub-disciplines of Music Information Retrieval (MIR).² Most of the researchers in this movement are natural scientists who, with a desire to analyze music, have organized themselves around two leading groups:³ ISMIR⁴ and SMC.⁵ In the era of an overwhelming flood of data, the multidisciplinary methodology and applied focus of MIR projects enabled these ideas to migrate to natural sciences in general as well as the social sciences and humanities. Apart from research activity, music information methodologies began to appear in many academic curricula. With

1 Peter Burke, *Cultural Hybridity* (Cambridge: Polity Press, 2009), 5.

2 MIR = *Music Information Retrieval*

3 Despite ISMIR and SMC being two of the largest research communities, MIR endeavors yearly gain at least one (temporary or permanent) space (e.g., conference, research team/unit, journal, etc.), within which a portion of their ideas can be executed.

4 ISMIR = *International Society for Music Information Retrieval*, <https://ismir.net/>.

5 SMC = *Sound and Music Computing*, <https://smcnetwork.org/>.

the expansion of the field, the narrowly represented domain of the MIR field of only a few decades ago has become increasingly heterogeneous, although groups such as ISMIR, despite expanding their initiative, maintain some (unofficial) niche preferences or trends, especially when it comes to questions of methodology.⁶ Apart from the two communities, a wide variety of computational methods for studying, teaching, or making music are now also appearing elsewhere, for example in contributions to EMR,⁷ SysMus,⁸ IAML,⁹ FMA,¹⁰ and last but not least, in the present issue of the *Musicological Annual*.

The diverse use of methodologies is becoming the practice of many research groups and individuals. However, those reluctant to embrace the emerging “disciplinary chaos” continue developing their research activities within rather traditional frames. Many authors¹¹ have pointed out the various reservations that accompany incoherent communication between music research and hybrid or fully computational disciplines. Rather than providing an overall overview of particular challenges, we will focus on three major problem groups, from the point of view of 1. the institutional organization, 2. technological interactions, and 3. technologically-methodological barriers of computer-assisted music research.

The first obstacle – the development and/or transformation of institutional systems, both in the field of music or musicological aims and within other fields – stems from a categorical entrenchment of academic structures. As some have already observed,¹² this issue originates from the rigid, but by no means self-evident, *disciplinary* distribution (e.g. the division into musicology, sociology, psychology, etc.), to the shortcomings of the Bologna Process for higher education. It is particularly evident in the way in which research productivity is scored. The scoring system encourages (meaningless) competition between individuals on the “academic market” rather than assuring a collaborative atmosphere. All of the above often complicates the conditions for

6 Trends can be observed already on the surface level, meaning the thematic selection of yearly accepted proceedings to the ISMIR conference. In the last couple of years, we can surely observe an increased interest in neural networks and deep learning.

7 “Empirical Musicology Review,” accessed in November 2022, <https://emusicology.org/>.

8 “Systematic Musicology Conference,” accessed in November 2022, <https://www.sysmus22.ugent.be/>.

9 “International Association of Music Libraries,” accessed in November 2022, <https://www.iaml.info/>.

10 “Folk Music Analysis,” accessed in November 2022, <https://www.folkmusicanalysis.org/>.

11 See, for example: Stephen Downie J., “Music Information Retrieval,” *Annual Review of Information Science and Technology* 37 (2003): 295–340; Turek Dahling, et. al., eds., *Musicology (Re-) Mapped: Discussion Paper*, (Strasbourg: European Science Foundation, 2012); Frans Wiering and Emmanouil Benetos, “Digital Musicology and MIR: Papers, Projects and Challenges,” *International Society for Music Information Retrieval Conference* (2013); Laurent Pugin, “The Challenge of Data in Digital Musicology,” *Frontiers in Digital Humanities* 2 (2015): 4; and others.

12 Avtorska skupina, *Kaj po univerzi?* (Ljubljana: Založba I*cf, 2019).

the free transformation not only of the formal but also of the substantive part of academic work and curricula and is severely restricting the active flow of knowledge between disciplines and their institutional carriers. If cooperation is to take place, at least one of the disciplines must submit to the system of the main institution, which (financially) initiates that particular collaboration. The further apart the disciplines, the less interaction is possible under such terms.¹³

Second, even if we would like to believe that the structural arrangements of academia are mostly supportive of interdisciplinarity, the integration of musicology and music informatics (as well as other hybrids) is also restricted by the constitution of methodology. In the process of epochal technological change, there has never been a sudden replacement of old technology for a brand-new solution. Instead, a change of medium occurred through a process of transition. This process, in a computational sense, took advantage of “the known,” thus familiar images of gadgets or implemented the features of “instinct,” physical actions of an old apparatus, and implemented those to the user experience of the new medium.¹⁴ These mediators enable the comprehension of the frontal functionality of the digital tool even though the core “machinery” of such application is completely incomprehensible to an average user. In contrast to the leisurely (or similar) use of digital gadgets, the computational analysis of music, or its digital exploration, has undergone a much less gradual leap. The background (applications, interfaces, etc.) or even the foreground (codes of algorithms that carry out a given process without a visually pleasing interface) of most computationally analytical (music) tools are driven by adapted mathematical operations woven into a web of algorithms and chiffres that have little, if anything at all, in common with the actual object or the process of (physical) analysis. The sudden leap from the physical world into the world of incomprehensible codes has made the process of integration more difficult for

13 This is most evident through observing calls for project fundings, which are usually tailored according to the structure of one discipline (but not necessarily fit with the other(s)). Likewise, it is more certain that one's contribution will be published in the journal or conference of another discipline, when that contribution is tailored to the measurements of the journal preferences. If we concretely consider ISMIR: when a musicologist publishes a contribution to ISMIR conference, they have to oblige to (at least) 1. The structure of the contribution (six two-column pages, edited in ISMIR's LaTeX preset, different citation rules, preferred internal structure (e.g.: introduction, related work, methodology, case study and/or evaluation, conclusion)), and 2. content category, which needs to be indicated upon submitting an article (if none of the offered categories correspond with one's contribution, the author is forced to choose the closest one, by which he risks the content inadequacy and with that, refusal of the article, no matter its value). Next to the two conditions, there is a selection of editors and reviewers, which usually agree in majority with the current trends. And these are rarely compatible with musicological activity. With each deviation, the musicological contribution drifts away from being published, which indicates that we, in fact, cannot speak about a fruitful environment for multidisciplinary collaboration.

14 For example, the transfer of brush and “canvas” as icons to digital painting environments, the preservation of musical notation sheet format and even the mimicry of paper texture in programs for the digital notation of symbolic music (MuseScore, Sibelius, Finale, etc.).

musicologists. With the absence of a transitional moment, the abstract algorithms and their products (for example, sequences of “mathematical” symbols describing musical phenomena) do not manage to address them in an intelligible way. For the majority of researchers, who do not manage to adopt the computational processes of machine learning, neural networks, or even simpler algorithmic structures, insufficient familiarity with methodological procedures prevents them from using the results obtained from this type of analysis, simply, because they do not understand how or where these solutions emerged from. If such obfuscation does not stop the average user of an algorithmically guided interface (for example, the capture of auto-retouched images with smartphones or the even more current practice of leisurely creating iconographic images with linguistic markers¹⁵), involvement in the nuts and bolts of algorithms is indispensable for the research work of the musicologist. The urge to be involved in the latter most often stems from *functional reasons*,¹⁶ whereas participation in every day, leisurely digital use is mostly overdetermined by the desire to freely choose the final fate of our interaction, making a full understanding of the background irrelevant as long as one feels involved.¹⁷

Third, computational methods remain very limited in certain areas – such as the analysis of vertical musical structures in relation to horizontal ones, the lack of a strategy for exploring non-Western or non-tempered musical notations (and recordings), etc. Also, with the uneven distribution of resources, the digitization of music material is disproportionately more common in Western institutions, while musical traditions with smaller coverage remain both physically and methodologically less represented in the (computer-supported) research landscape. The collection and accessibility of diverse musical material primarily depends on the direction of financial and infrastructural resources, which are often over-determined by its “market” value and/or attractiveness. The third set of constraints is thus a product of the first two issues, the spatio-temporal limitation of the research space and the inability to engage directly with (field-relevant) technology on a large scale. The researcher who wants to do computationally-supported research is largely limited by the above-mentioned problems. Today, these processes commonly leave the researcher to the fate of either eternally collecting and converting the material¹⁸ instead

15 See, for example: OpenAI, “Dall-E,” accessed in November 2022, <https://openai.com/blog/dall-e/>.

16 Here, I generally consider the favoring feeling of authentic expression opposed to the “fake,” uncontrolled event, even though the impact of our active participation, in comparison to the whole process that is being executed in the back, is barely recognizable.

17 For example, a conversion from a physical format (e.g. manuscript) to digital (scan) and then to computer-readable formats (MusicXML, Sibelius, Finale, etc.), all of which is extremely time consuming.

18 Johanna Drucker. “Humanistic Theory and Digital Scholarship,” *Debates in the Digital Humanities* 150 (2012): 85–95.

of actually executing the research on those materials or limits their research to only accessible computational methodology and ready-made materials, e.g., the already digitized contents, regardless of the alignment of the latter with their field of interest.

In order to create a transitional era of computational engagement of musicologists, it is, therefore, necessary to consolidate both sides – the musicological and the information-technological. Both structural and technical-methodological complications dictate the need for a critical reflection on the organization of the domains and in particular highlight the cumbersomeness of the established paths of our primary domain and its interdisciplinary subfields. Even though MIR already provides hyper-production of (digital) music-analytical tools, these are rarely (if ever) applied beyond the computational disciplines. It is thus only mutual navigation that can ensure fruitful, active interdisciplinary development and knowledge exchange.

If we take the liberty of paraphrasing the comment by historian Peter Burke quoted in the beginning, the thought would go as follows: “those whose research is interdisciplinarily are not always aware of the limitations of their own discipline.”

The contributions offered in this issue of the Proceedings of Musicology reveal a range of current interdisciplinary, computer-assisted musicological projects. The diversity of topics offers a view of the dynamics of contemporary musicological activity, in particular of its relations with (more or less computer-centered) natural sciences. Rather than setting an example of interdisciplinarity, this issue should be read as an encouragement towards an active and critical dialogue on the future(s) of musicological work in the reign of technology. As Johanna Drucker observed,

*the humanities are not a mere afterthought, simply studying and critiquing the effects of computational methods. The humanistic theory provides ways of thinking differently, otherwise, specific to the problems and precepts of interpretative knowing – partial, situated, enunciative, subjective, and performative. Our challenge is to take up these theoretical principles and engage them in the production of methods, and ways of doing our work on an appropriate foundation.*¹⁹

However, it is this foundation that yet needs to be established.

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19 For example, a correct use of the options that the tool provides, as well as successfully obtaining and correctly interpreting those options or its results.