Predgovor

V vročičnem vzponu interdisciplinarnih prizadevanj se znanstveni zborniki, revije in konference, pa tudi projektne in ostale institucionalne tvorbe čedalje pogosteje odmikajo od izrecne disciplinarne zamejitve. Svoj prostor čedalje pogosteje odpirajo projektom večdisciplinarnih raziskovalnih skupin, a kljub temu »tisti, ki delujejo v eni disciplini, ne vedo vselej, kaj se dogaja v nekaterih drugih.«[1] Tokratna številka *Muzikološkega zbornika* je namenjena osvetlitvi povezovalnih aspiracij sodobnega muzikološkega raziskovanja, zlasti dejavnosti na področju računalniško podprtega raziskovanja glasbe.

Proučevanje glasbe se izvaja v različnih domenah. V povezavi s kognitivnimi študijami se medij glasbe uporablja kot stranski ali osrednji pojem za raziskovanje kognitivnih in emocionalnih procesov, medtem ko mnoge družboslovne študije glasbo obravnavajo kot sociokulturni, socioekonomski ali povsem zgodovinski pojav. Dobršen del muzikoloških dejavnosti glasbo v veliki meri obravnava kot osrediščeno strukturo, osmišljeno že s samo notranjo ureditvijo notacijsko simbolne (ali zvočne) materije, brez vključitve zunajglasbenih fenomenov. Poleg predhodno izdelanih glasbenoteoretičnih izhodišč (kamor sodijo zlasti različni pristopi in teorije glasbenih analiz) se v analizi glasbe vedno pogosteje uveljavljajo tudi metodološke predpostavke akustike, matematike, ikonografije in drugih ved. Četudi je teoretska osnova v tovrstnih pristopih praviloma ukrojena po meri posameznega raziskovalnega primera, se proučevalci glasbe s svojo metodologijo dandanes vse pogosteje zatekajo k uporabi računalniških orodij.

To, kar so bili sprva eksperimenti tehnoloških zmožnosti, so na področju računalniško podprtega raziskovanja glasbe sčasoma prerasli v povsem novo institucionalno *disciplino* ali, še bolje, *skupino poddisciplin* pridobivanja podatkov iz glasbe (MIR).[2] Raziskovalci tega gibanja so povečini naravoslovni znanstveniki, ki so se z željo po analizi glasbe organizirali okoli dveh vodilnih skupin: ISMIR in SMC.[3] Ob neobvladljivi poplavi podatkov sta jim večdisciplinarna metodologija in aplikativni smoter njihovih projektov odprla vrata tako v širše naravoslovno kot tudi družboslovno in humanistično polje,

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1   Peter Burke, *Kulturna hibridnost*, prev. Polona Glavan (Ljubljan: Studia humanitatis, 2020), 12.

2   MIR = *Music Information Retrieval*.

3   Čeprav sta ISMIR (International Society for Music Information Retrieval – Mednarodna skupnost za pridobivanje podatkov iz glasbe, https://ismir.net/) in SMC (Sound and Music Computing (network) – Računalniška mreža za zvok in glasbo, https://smcnetwork.org/) še vedno največji skupnosti, pa MIR mreža vsakoletno pridobi vsaj en nov (začasni ali stalni) prostor (tj. konferenco, raziskovalno ekipo, zbornik, revijo itn.), v katerem lahko udejanja delček svojega poslanstva.

glasbenoinformacijski metodološki postopki pa so se začeli pojavljati tudi v prenekaterem študijskem kurikulumu. S širitvijo področja postaja še pred leti ožje zastavljena domena področja MIR vedno bolj heterogena, vseeno pa imajo skupine, kot je ISMIR (sicer nezapisane) nišne preference, zlasti ko gre za vprašanja metodologij.[4] Najrazličnejše računalniške metode za proučevanje, poučevanje ali ustvarjanje glasbe se danes pojavljajo tudi drugod, na primer v prispevkih za EMR,[5] SysMus,[6] IAML[7] in FMA,[8] nenazadnje pa tudi v pričujoči številki *Muzikološkega zbornika*.

Raznovrstna uporaba metodologij postaja praksa mnogoterih raziskovalnih skupin in posameznikov; tisti, zadržani do nastajajočega »disciplinarnega kaosa,« pa na svojih toriščih vztrajajo pri že preverjenih metodoloških prijemih. Na razne zadržke, ki spremljajo nekoherentno komunikacijo med disciplinami, je opozarjalo že mnogo avtorjev.[9] Namesto celostnega pregleda partikularnih izzivov bomo na tem mestu opozorili na tri večje problemske skupine: *institucionalno organiziranost*, *tehnološkointerakcijsko* in *tehnološkometodološko* plat računalniško podprtega raziskovanja glasbe.

Prva zavora razvoja in/ali preobrazbe institucionalne ureditve, tako na področju glasbenih oziroma muzikoloških smernic kot tudi znotraj ostalih področij, izvira iz kategorične zasidranosti v kalup akademske ureditve. Nekateri raziskovalci so že opozorili,[10] da se ta udejanja vse od trdne, a nikakor samoumevne disciplinarne razporeditve (npr. delitev na muzikologijo, sociologijo, psihologijo itd.), do pomanjkljivosti bolonjske ureditve visokošolskega izobraževalnega sistema in zlasti načina točkovanja produktivnosti raziskovalca, ki namesto t. i. timskega dela vzpodbuja (nesmiselno) tekmovalnost med posamezniki. Vse našteto pogosto otežuje pogoje prostega preoblikovanja ne le formalnega, temveč tudi vsebinskega dela akademskega dela in kurikuluma, ter hkrati precej omejuje aktiven pretok znanja med disciplinami in njihovimi institucionalnimi nosilci. V kolikor uspe priti do sodelovanja, pa se mora vsaj ena izmed disciplin podrediti sistemu tistega, ki je glavni nosilec razpisanih

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4 Trende lahko zaznamo že iz tematskega nabora letno sprejetih prispevkov na konferenco ISMIR. V zadnjih nekaj letih so to gotovo tisti s področji nevronskih mrež in globokega učenja nevronske mreže in globoko učenje.

5 »Empirical Musicology Review,« dostop novembra 2022, https://emusicology.org/.

6 »Systematic Musicology Conference,« dostop novembra 2022, https://www.sysmus22.ugent.be/.

7 »International Association of Music Libraries,« dostop novembra 2022, https://www.iaml.info/.

8 »Folk Music Analysis,« dostop novembra 2022, https://www.folkmusicanalysis.org/.

9 Gl. na primer Stephen Downie J., »Music Information Retrieval,« *Annual Review of Information Science and Technology* 37 (2003): 295–340; Turek Dahling in dr., ur., *Musicology (Re-)Mapped: Discussion Paper* (Strasbourg: European Science Foundation, 2012); Frans Wiering in Emmanouil Benetos, »Digital Musicology and MIR: Papers, Projects and Challenges,« v *International Society for Music Information Retrieval Conference* (2013); Laurent Pugin, »The Challenge of Data in Digital Musicology,« *Frontiers in Digital Humanities 2* (2015): 4; in drugi.

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

dejavnosti (tj., inštitut, razpis (npr. ARRS), laboratorij, univerza, revija ali konferenca in tako naprej).[11]

Drugič, četudi bi želeli verjeti, da strukturne ureditve akademskega sveta v večini podpirajo interdisciplinarnost, se pri povezovanju muzikologije in glasbene informatike (kot tudi pri drugih hibridih) zaplete tudi pri vprašanju metodologije. V procesu epohalnih tehnoloških sprememb nikoli ne prihaja do nenadne zamenjave stare tehnologije z novo, temveč so spremembe medija vselej rezultat tranzicijskega procesa. Ta v uporabniško izkušnjo umešča že znane podobe pripomočkov,[12] ki v procesu računalniškega zapisovanja namesto izvajanja dejanskih funkcij uporabniku omogočajo enostavnejše prehajanje iz enega na drug, v svojem jedru za uporabnika tudi povsem nerazumljiv medij. Za razliko od prostočasne uporabe digitalnih pripomočkov je računalniška analiza glasbe oziroma njeno digitalno raziskovanje doživelo veliko manj postopen preskok. Večji del računalniško-analitičnih (glasbenih) orodij v ozadju (aplikacije, vmesniki itn.) ali celo v ospredju (neposredno srečanje s kodami algoritmov, ki izvajajo določen proces brez vizualno prijetnejših vmesnikov ali aplikacij) poganja v mrežo algoritmov spletene matematične operacije, ki imajo le malo skupnega z dejanskim objektom ali procesom analize. Nenadni preskok iz fizičnega sveta v svet računalniških kod je muzikologom z izostankom tranzicijskega momenta otežil proces vključevanja, saj jih abstraktni algoritmi in njihovi produkti (na primer niz »matematičnih« znakov, ki opisujejo glasbene pojave) ne nagovorijo na razumljiv način. Glavnini raziskovalcev, ki ji računalniških procesov mehanskega učenja, nevronskih mrež, pa tudi enostavnejših algoritmičnih struktur ne uspe usvojiti, meglena predstava o metodoloških postopkih tudi onemogoči uporabo pridobljenih rezultatov tovrstne analize. Če takšna zameglitev ne ustavi povprečnega uporabnika algoritemsko vodenega postopka analize (kot to velja denimo za zajemanje avto-retuširanih posnetkov s pametnimi telefoni ali za še aktualnejšo prakso prostočasnega ustvarjanja

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11 To se kaže na primer pri prijavljanju na razpise, ki so načeloma urejeni po ustaljenih merilih ene discipline. Prav tako je verjetnost za objavo prispevka v sklopu revije drugih disciplin veliko večja takrat, ko je prispevek strukturno in vsebinsko prilagojen prevladujočim formatom tiste druge discipline. Če pogledam konkretno: ko muzikolog objavi prispevek na konferenci ISMIR, mora ta upoštevati vsaj: 1. strukturo članka (šest dvostolpičnih strani, urejenih v LaTex predlogi, drugačen tip navajanja virov, vnaprej določena oblika sosledij poglavij (na primer, uvod, pregled relevantne literature, metodologija, študija primera ali preveritev podatkov, zaključek)) in 2. vsebinsko primernost, za katero se mora izreči ob oddaji prispevka (v kolikor ta ni zastopana, mora izbrati naslednjo najbližjo tematsko skupino, pri čemer tvega vsebinsko neustreznost in s tem zavrnitev prispevka v objavo). 3. Nato je tu še nabor urednikov in recenzentov z (zgoraj omenjenimi) tematskimi preferencami, ki so le redko povsem kompatibilne z muzikološko dejavnostjo. Z vsakim odstopanjem tako muzikološki prispevek tvega svojo izključitev iz procesa, kar kaže na to, da le stežka govorimo o ugodnih pogojih za meddisciplinarno sodelovanje.

12 Tako na primer delujejo prenos podobe čopiča in »platna« v digitalna slikarska okolja, ohranitev notnega črtovja in celo mimika teksture papirja v programih za digitalno zapisovanje simbolne glasbe (MuseScore, Sibelius, Finale, itd.).

ikonografskih podob z jezikovnimi označevalci),[13] je za raziskovalno delo muzikologa vpletenost v kolesje algoritmov nepogrešljiva. Nuja po vključenosti pri slednjem največkrat izvira iz *funkcionalnih* razlogov,[14] medtem ko je soudeležba v vsakdanji, prostočasni digitalni uporabi večinoma naddoločena z željo po svobodnem izbiranju končne usode naše interakcije,[15] zaradi česar popolno razumevanje ozadja, dokler se počutimo vključene, ni relevantno.

Tretjič, računalniške metode ostajajo na določenih področji – kot so analiza vertikalnih glasbenih struktur v odnosu s horizontalnimi, pomanjkljiva strategija za raziskovanje nezahodnih ali netemperiranih zapisov (in posnetkov) glasbe itn. – zelo omejene. Prav tako je z neenakomerno porazdelitvijo sredstev digitalizacija glasbenega gradiva v zahodnih institucijah neproporcionalno pogostejša, medtem ko ostajajo glasbene tradicije z manjšimi pokritji tako fizično kot metodološko manj zastopane v raziskovalnem prostoru. Zbiranje in dostopnost raznolikega glasbenega materiala (p)ostaja odvisna od usmeritve finančnih in infrastrukturnih sredstev, ki jih nemalokrat naddoloča »tržna« zanimivost. Tretja skupina omejitev je tako v resnici plod prvih dveh problematik, prostorsko-časovne omejitve raziskovalnega prostora in nezmožnosti množičnega neposrednega sodelovanja z (za področje) relevantno tehnologijo. Raziskovalca, ki želi raziskovati s pomočjo računalnika, omenjeni problemi danes v veliki meri prepuščajo usodi večnega zbiranja in pretvarjanja formatov materije (iz fizičnega zapisa (npr. rokopis) v digitalni (sken) in nato še računalniško berljiv format (MusicXML, Sibelius, Finale idr.)) namesto dejanskega raziskovanja ali pa omejitev raziskave na zgolj dostopno metodologijo in digitalizirane materiale.

Za vzpostavitev *tranzicijske ere* računalniškega udejstvovanja muzikologov je torej nujna konsolidacija obeh bregov: muzikološkega in informacijsko-tehnološkega. Tako strukturni kot tudi tehnično-metodološki zapleti narekujejo potrebo po kritični refleksiji ureditve področij, še zlasti pa izpostavljajo okornost utečenih poti naše primarne domene in njenih interdisciplinarnih podmladkov. Ne glede na to, da MIR že zagotavlja hiperprodukcijo (digitalnih) glasbeno-analitičnih orodij, so ta le redko (če sploh) aplicirana onkraj računalniške stroke. Vzajemno krmarjenje je tisto, ki lahko zagotovi ploden interdisciplinarni razvoj.

Če si za zaključek dovolimo preobraziti uvodoma navedeni komentar zgodovinarja Petra Burka, bi se misel glasila takole: »kdor deluje interdisciplinarno, ne pozna vselej omejitev svoje lastne discipline.«

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13   Gl. na primer: OpenAI, »Dall-e,« dostop novembra 2022, https://openai.com/blog/dall-e/.

14   To velja na primer za korektno uporabo orodij ter ustrezno pridobitev in interpretacijo rezultatov, ki nam jih orodje ponudi.

15   Tu gre zlasti za občutek avtentičnega izražanja pred »umetnim,« povsem nenadzorovano izvršenim dogodkom, četudi je naš aktivni vložek v primerjavi s celotnim procesom skoraj povsem neopazen.

Večina prispevkov, ki jih ponuja tokratna tematska številka *Muzikološkega zbornika*, razgrinja paleto aktualnih interdisciplinarnih, računalniško podprtih muzikoloških projektov. Raznovrstnost vsebin odstira pogled na dinamiko sodobnega muzikološkega delovanja, še zlasti pa razmerij z (bolj ali manj računalniško osrediščenimi) naravoslovnimi disciplinami. Namesto zgleda ali leporečja o interdisciplinarnosti naj se ta številka bere kot pobuda k aktivnemu in kritičnemu dialogu o prihodnosti(h) muzikološkega dela v vladavini tehnologij. Kot je zapisala Johanna Drucker,

> *humanistika ne igra le vloge interpreta in kritika vnaprej pripravljenih računalniških tvarin. Humanistična teorija lahko zagotovi drugačne načine razmišljanja, značilne za probleme in principe interpretativnega raziskovanja – naš izziv je prevzeti ta teoretična načela in jih vključiti v ustvarjanje takšnih metod, ki bodo ustrezale temeljem našega dela.*[16]

Tudi te temelje si je treba najprej ustvariti.

Vanessa Nina Borsan, urednica
Leon Stefanija, urednik

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16   »the humanities are not a mere afterthought, simply studying and critiquing the effects of computational methods. The humanstic theory can provide ways of thinking differently, otherwise, specific to the problems and precepts of interpretative knowing – our challenge is to take up these theoretical principles and engage them in the production of methods, ways of doing our work on an appropriate foundation.«

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] ISMIR[4] 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

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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 authors[11] 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

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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 /*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

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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 markers[15]), 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 spatiotemporal 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 abovementioned problems. Today, these processes commonly leave the researcher to the fate of either eternally collecting and converting the material[18] instead

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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.

Vanessa Nina Borsan, editor
Leon Stefanija, editor

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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.